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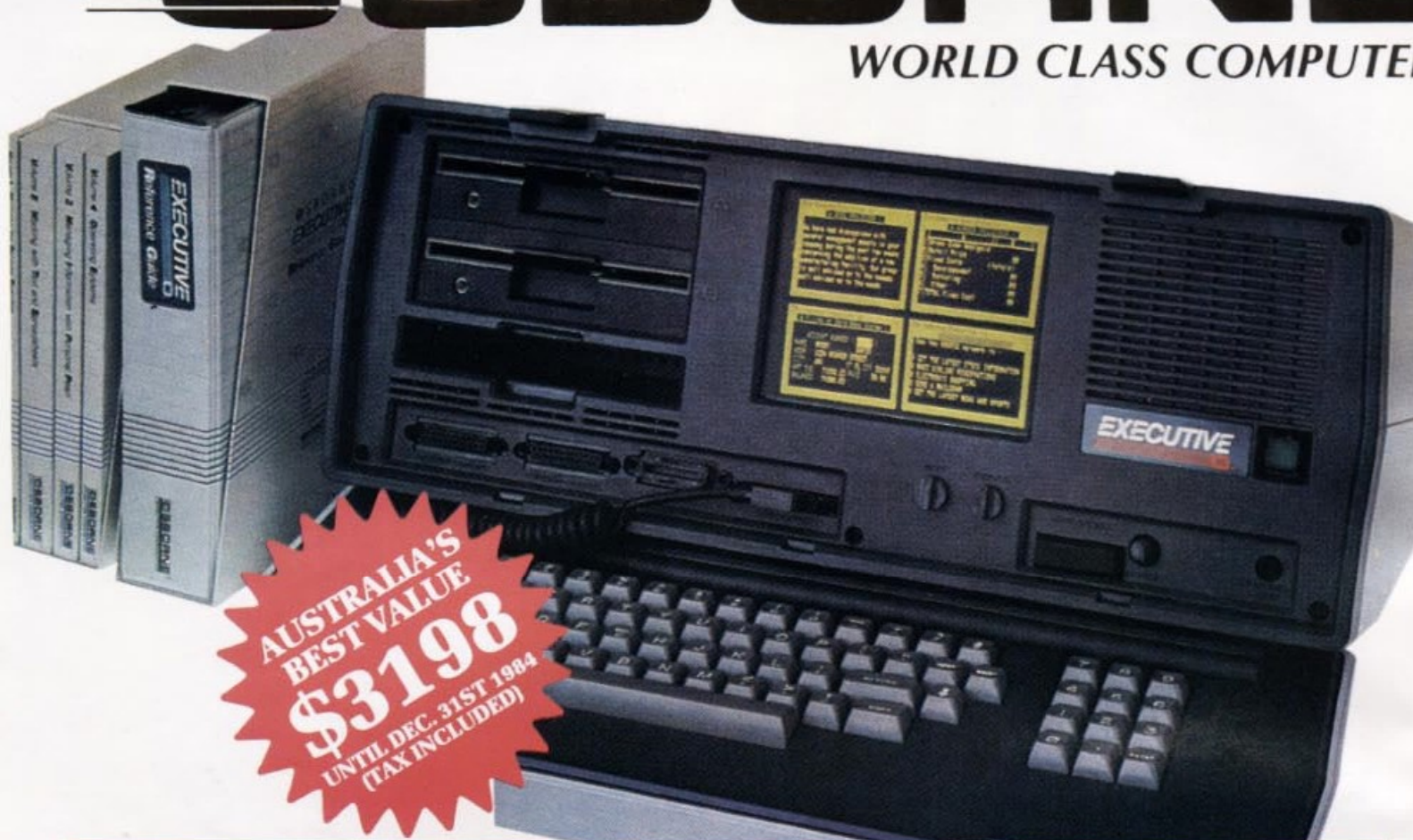
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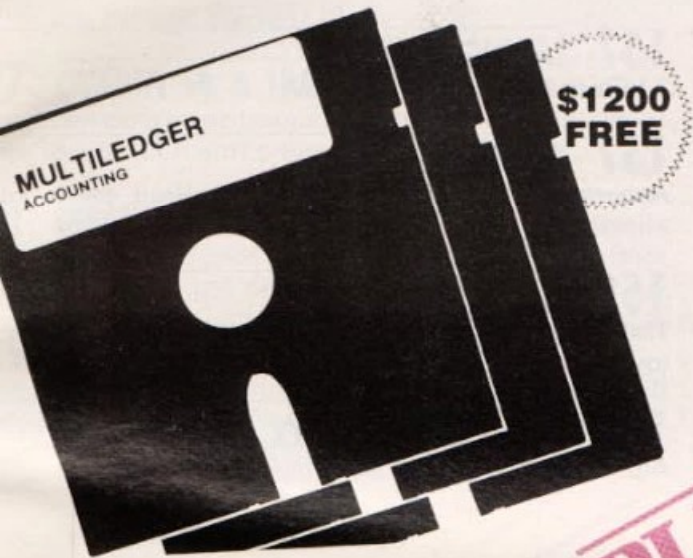
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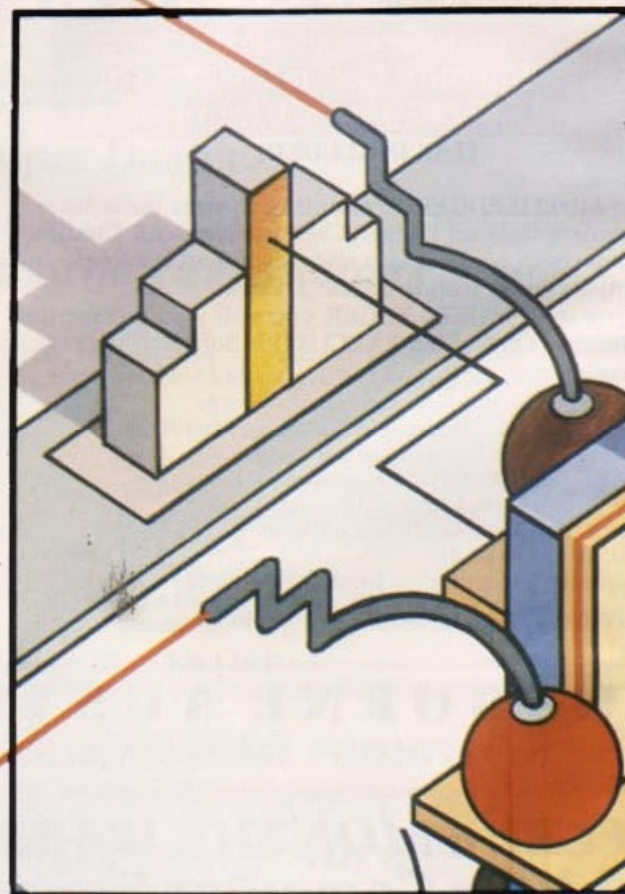
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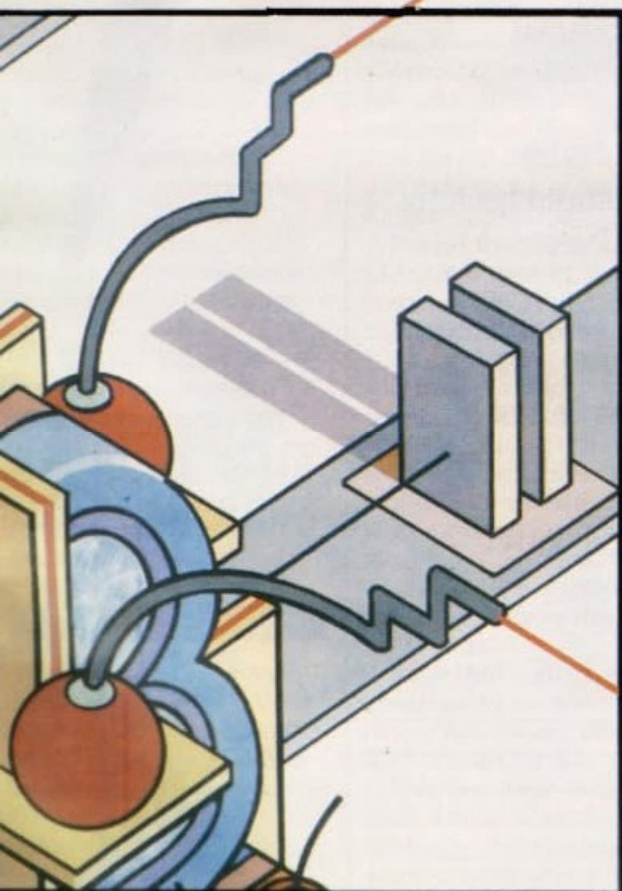
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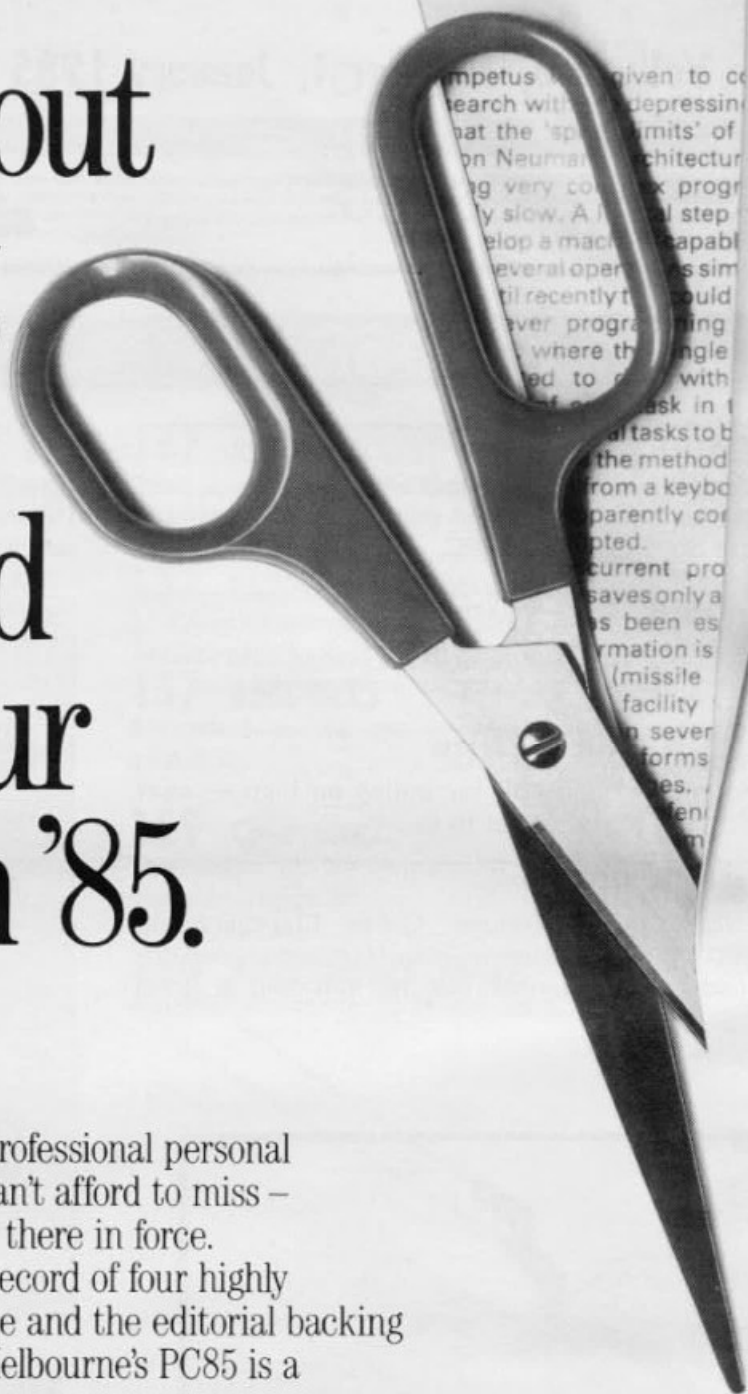
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Intrepid reporters from the four corners of the Earth bring news of super large capacity floppy disks; mainframe software producers acknowledging there's money to be made in the PC market-place; a quick history of PCs in Australia; and more in this month's Newsprint.

IBM's latest weapon — the 'Fear Factor'

As 1984 drew to a close, US microcomputerdom was taking stock and pondering the future. This has been the year that the optimists' projections proved to be a bust; what will 1985 bring?

For a start, the era of venture capitalists in microcomputer products is probably over. At the Comdex show in Las Vegas there was little of the manic enthusiasm of previous years, when dozens of hopeful start-ups burning venture capital brought new machines and/or new software to the show.

Instead there were a few innovative lap-held machines such as the Data General One and the Texas Instruments Pro-Lite, and all were conspicuously IBM-compatible. The only big software announcement was of Lotus's Jazz (1-2-3-4!) or the Macintosh, which wasn't even announced at the show since Lotus refused to spend \$500,000 in a booth and instead took reporters off to a converted hangar.

Nor was Las Vegas as welcoming as in previous years. The word is out on computer conventioners — they don't drink much, they don't stay up late, and they sure don't gamble in hotel casinos. No wonder some hotels this year refused to take any of the poor unhappy things.

Why unhappy? Why such concern for the future? Well, regular readers may recall IBM's cherished dream of a Blue World in which all computing is done on IBM machines. That world continues to draw closer.

Indeed, as IBM continues to lower prices, the remaining

IBM clones may be driven out of business. Nor does the other US giant, AT&T, seem to really understand the micro business or be prepared to compete effectively. Now IBM is angling hard for the software market and the big fear is on.

Ben Rosen, New York venture capitalist, chairman of Compaq, and the key investor in Lotus 1-2-3, says venture capitalists evinced 'extreme reticence now to get into anything that could be in IBM's playpen. IBM is having a chilling effect on new ventures, a fear factor'. (Note: micros still account for only 14 per cent of IBM's \$45 billion revenue).

Even Kaypro, sturdy defender of 8-bit CP/M, gave in and announced the Kaypro 16, an IBM compatible with 256k of RAM and both hard and floppy disks. This for \$3,295. 'It's what our dealers asked for,' said a Kaypro spokesman.

Not all the blame can be laid at the door of IBM, however. On Wall Street the big institutional investors such as Morgan Guaranty and Bankers Trust (with portfolios worth \$18.7 billion each) are not interested in dangerous hi-tech stocks that nose-dive shortly after introduction (for example Eagle Computer, which made a \$12 a share issue that now lurks in the 80 cent range).

Even IBM's stock, despite consistently excellent earnings, has swung between \$99 and \$128 this year.

This is a huge range for such a solid blue chip and evidence of the volatility in a stock market where money managers, working for the institutions, are desperately

churning stocks around in search of fractional profits to make their monthly targets.

Since the small investors have largely fled the stock market in recent years as a result of such volatility, the big institutions are the whole ball game. It is to them that the venture capitalists must go for the money to fuel little start-ups like Apple and Lotus. The venture capitalists can no longer expect to find funds for further IBM clones.

One interesting pointer on next year's business was provided by Software Access, a Californian market research firm. Its study showed that only 13 per cent of people without computers have any plans to buy one in the next 12 months. In contrast 37 per cent of

home micro users and 52 per cent of work users expect to buy *another* computer in the same time period.

Which means an experienced marketplace with very choosy consumers who will be looking for extra points of value and usefulness in shaping their decisions.

Enter a familiar figure in the micro market. Jack Tramiel says US manufacturers have become 'greedy' and 'too dull'. His new Atari Corporation is preparing two 8-bit machines, two 16-bit, and a 32-bitter for releases beginning in January. Tramiel, of course, has shaken up US microcomputerdom before — and with any luck he'll do it again in 1985.

Chris Rowley

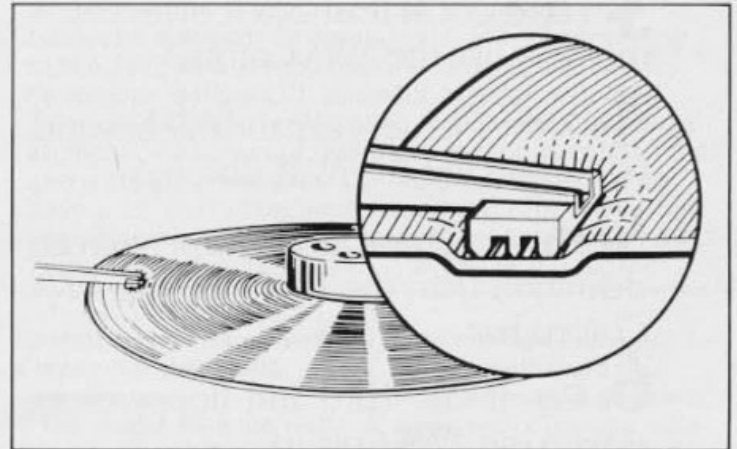


Diagram of 3M's SSR disk showing the dimpling effect of the disk's surface

5Mb Floppies

'Stretch-Surface Recording' may change the future of conventional disk drives, according to 3M, by offering the benefits of hard disk storage at close to floppy prices.

The patented 3M SSR technique uses a rigid plastic disk with raised edges. A 60 micron thick flexible media membrane is stretched across and slightly

above both surfaces of the disk — the assembly resembling a small shallow drum.

Slightly modified magnetic read/write heads fly just above the surface recording media which rotates at a whopping 3,400 rpm. Air pressure causes the membrane to dimple beneath the head leaving a gap of about 5 microns. Because the membrane is stretched tightly the continually moving dimpled area restores itself rapidly, flinging off

Twelve awkward questions that will tell you if a PC is productive.

1. Is it a 16-bit model like the AWA Corona - powerful enough to cope with all your business requirements?

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debris during each pass in a rampoline-like manner.

"It throws off dirt so well that at Comdex in November, we ran 5Mb per side prototypes with the covers off and had a test rig highlighting disk errors", says David Clancy, 3M Australia's Data Recording Products Marketing Manager. "The rate was about the same as for sealed rigid disk drives — one soft error every 10 billion bits."

The new 3M disks are inherently rugged. Even deliberately 'landing' the head onto the membrane causes no damage or loss of data, according to 3M.

The membrane's resilience ensures that the drive is also less susceptible to impact damage. "We've dropped them from a height of three inches while they're running — without damage" says Clancy.

The disks are injection-moulded from a polymer-composite substrate formulated so that the disk expands and contracts with temperature at the same rate and by the same amount as the metal components of the drive itself — thus nullifying the effect of the dimensional changes.

The stretched membrane also remains dimensionally stable despite changes in temperature and humidity and exhibits low 'anisotropy' that is, expands and contracts by similar amounts in all directions).

Stretched-surface pre-production units currently offer five megabytes per side (5¼ inch disks), using track densities of 345 tracks per inch. Spacing and density may be doubled in later units which are likely to have fixed storage capacities of 48Mb (37Mb for removable disk versions).

Hardware manufacturers in the US are currently evaluating the product, and commercial production of SSR disk drives is expected to start in mid-1985.

Clancy says that the introduction of SSR in Australia depends on the

speed with which OEMs adopt the technology.

"This could be anywhere between six months and two years", Clancy said.

Meanwhile 3M is researching 'vertical recording' (particles oriented vertically rather than horizontally), a technique enabling density to be increased at least one hundred times.

If this technology can be combined with SSR disks, 3M reckons the way is open for 100 Mb-plus drives at virtually floppy disk drive prices.

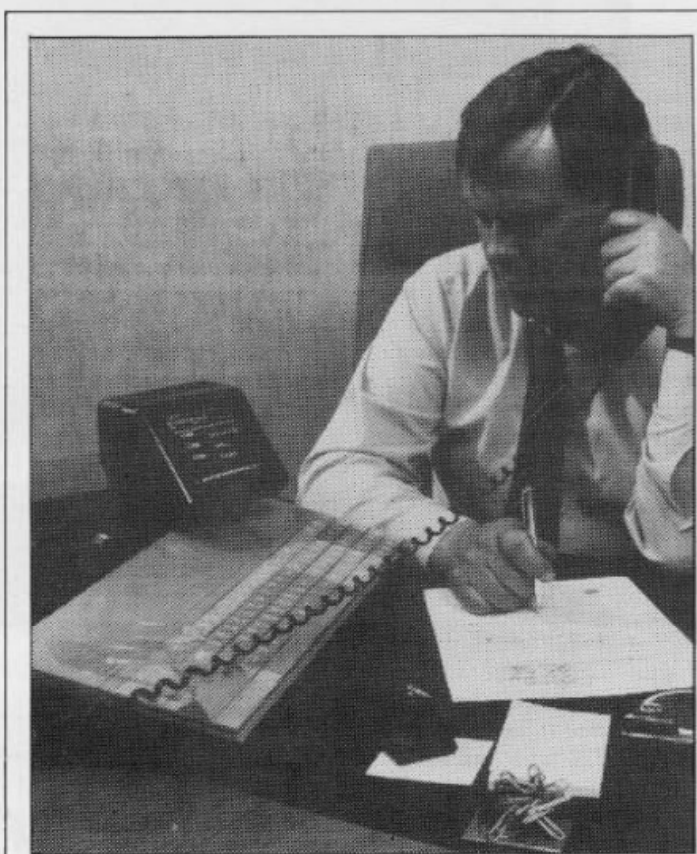
According to (US) Magnetic Media Information Services, if 3M succeed in producing such drives, they could "eliminate aluminium media from contention in small to medium sized drives . . . and most forms of tape-oriented back-up systems".

Mainframe software

Heard of Goldengate? — and I don't mean the San Francisco Bay bridge.

Heard of Cullinet? Well it's just about the biggest software company in the world and Goldengate is its new integrated PC software. It does all the sorts of things that Symphony and Framework do at about the same price and, more's the point, will talk to a mainframe computer as well, which is where Cullinet makes its money. It develops database systems, fourth generation languages and other fancy software for IBM mainframe machines and Goldengate is its first venture into the micro market.

The most significant point is that while Lotus, Ashton-Tate and their sundry distributors are spending mega-bucks trying to outsell each other in the retail arena, Cullinet is quietly and confidently directing its attentions to the corporate market with a fraction of the noise and razzle-dazzle of these parvenu PC software



The British seem to have bounced out in front with the trendy new concept of combining the PC with the telephone. Above is the Executel, "an 'intelligent' telephone that fulfils almost all the needs of a business manager or company director" according to the PR blurb. (Presumably this excludes certain hedonistic delights.) It appears to offer less than Telecom's ComputerPhone in that it lacks business applications software (word processor, database etc) and a Basic interpreter. On the other hand it does have a 20 year diary, and something referred to but not explained: "a special secretarial extension". STC Telecommunications make it, if you're interested.

houses, and perhaps there's a lesson for them here somewhere.

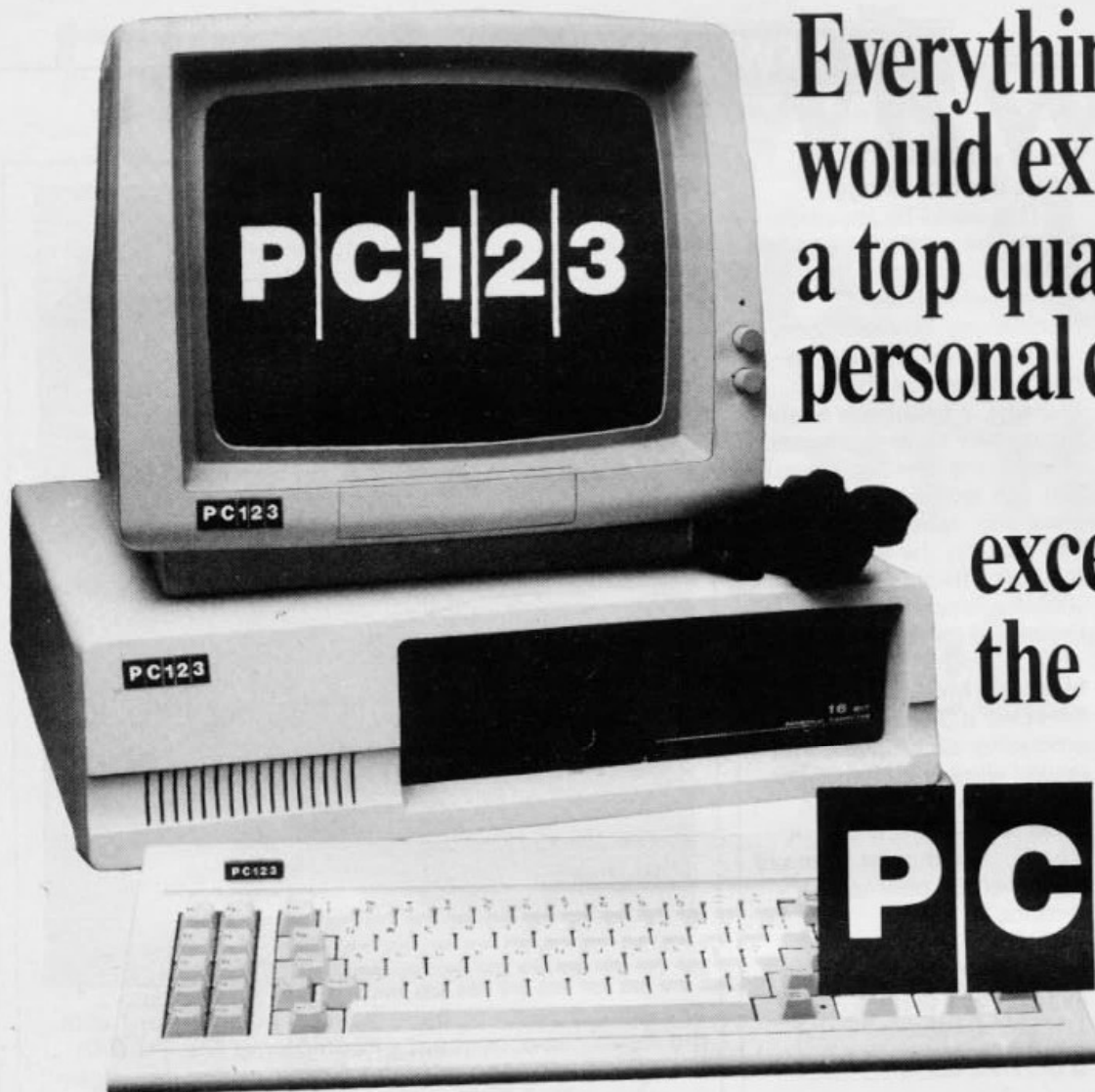
The people who are really going to use all these sophisticated new integrated packages are probably members of large organisations where much of the data they want resides on the company's mainframe computer and where corporate data processing professionals often say yea or nea to the purchase of PCs and software.

By the time it announced Goldengate in Australia, Cullinet had already sold twenty copies to a large and prestigious user, the United Permanent Building Society. In fact the society had been

beta testing Goldengate for some months and was reported to have chosen it, along with Cullinet's mainframe database, because Cullinet offered a range of products to meet UP's needs across the board, from mainframe database to PC spreadsheet with a link between the two.

The Lotuses and Ashton-Tates of this world can't hope to be so comprehensive, but another recent announcement highlights the fact that it's an important area.

The US company Informatics General (whose products are distributed here by Datec Pty Ltd) released Answer/DB, a product



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which allows users of PCs to obtain data held on an IBM mainframe. The PC components of the product have been designed to interface to specific software packages. They have been developed in collaboration with the manufacturers of those packages — Lotus, Ashton Tate and Visicorp.
Chris Kirkby

Users caught by IBM blind date

JAPAN — Among the various bits of flotsam and jetsam that find their way into my possession is a somewhat tattered copy of the current issue of the *Tokyo PC News*, newsletter of the Tokyo IBM user group. In some ways, it reminds me of those songs and poems that have something good happen, only to be followed immediately by something disastrous.

Like you show up on a blind date to be greeted by a vision of loveliness that makes Helen of Troy look like one of Cinderella's ugly sisters only to discover she has breath so fetid it would stop a train only to discover that she breathes but once an hour only to . . . I'm sure you get the picture.

Anyway, the good news is information on how to stuff an IBM PC with oodles of RAM at what look to me like great prices. For example, a 128k expansion board for my computer with discount costs about 40,000 yen (\$200).

If an IBM user buys an expansion board without chips (there's no indication of what the board costs), 256k chips run at about 8,000 yen (\$40). There's also information on who to buy the boards from in the US with a warning not to have them X-rayed.

It's the sourcing in the US that's the train stopper.

Not all the IBM PCs used

in Japan, or even just by the club members for that matter, were sold in Japan. In fact, many of the members are of the growing fraternity who come and go on the whim of their multinational employers — banks, insurance companies, manufacturers, advertising agencies, etc.

Sensibly, when they acquire a personal computer of more than games capability they don't want a product from some fly-by-night company whose address may quickly change from Silicon Valley to Death Valley, so naturally, they turn to IBM. They expect, at the very least, that with its global operations, IBM will be able to service their hardware, maybe even answer a few questions about operating systems and software no matter where in the world they use it.

Surprise. Surprise. That kind of thinking may well serve in other corners of the world, but it gets them nowhere over here.

The IBM PC in its various configurations including the Portable PC (just the thing for the busy world traveller) is sold exclusively by ComputerLand Japan who in turn purchase its machines from a division of IBM in the US which handles sales to foreign countries.

And it is to ComputerLand Japan that Mr Rising-International-Executive is referred when he calls IBM about getting some service for his not-purchased-in-Japan IBM PC. IBM Japan, he is told, wants nothing to do with it, despite its international warranty.

Since ComputerLand Japan has not seen one thin dime of profit on the particular faulty machine in question (all profits went to some other retailer and IBM), they don't have a lot of interest in servicing it. But they will, if the owner takes out a yearly service contract for ten per cent of ComputerLand's retail price for the machine in Japan.

(Thanks to duty, transportation and a surcharge imposed by IBM in the US to compensate its local subsidiary, this amounts to a premium of some 60 per cent over the price for the same unit in the US). Thus, it can cost you some \$700 or more just to be told you've a blown fuse.

Naturally, IBM users that didn't originally purchase their machines from ComputerLand Japan (who quite innocently is catching a lot of flack but can't be expected to look after IBM's spilled marbles) are rather put out with IBM, or Big Blue Meanie, as they are wont to call the company here these days.

Serge Powell

Jazz

Apple wasn't wrong when it said there'd be a wave of new software products for the Macintosh. Lotus has made a surprise announcement (well it surprised us) of Jazz, an integrated package including word processing, spreadsheet, database, communications and graphics. Obviously you'll need a Mac to run Jazz but you'll also need 512k of RAM and an external disk drive.

We haven't seen Jazz yet, but according to its Australian distributors, Imagineering, it utilises Mac features such as the mouse, pull down menus and multiple windows.

Existing Lotus product users would be interested to know that Jazz's communications capability allows transfer of data from 1-2-3, and Symphony files.

Jazz will sell for \$845.

Chat-up a Mac

The Macintosh can talk — I've heard it. Chirping away cheerily with the aid of a demo disk from First Byte Software called Smooth-talker.

I was fascinated and it set

me thinking about possible applications, especially when speech synthesis becomes a bit more sophisticated, as it is bound to do pretty quickly.

Smoothtalker requires no additional hardware — the audio circuits in the Mac are apparently capable of producing speech given the right kind of software. Although it will be available as a retail product (about \$150 in the US) Smoothtalker is aimed at software developers who wish to include speech in their programs. It consists of two parts: one to synthesise pre-determined messages in a program and one to convert data from the keyboard into voice messages. Each module will, First Byte says, take up just over 20k of RAM and may be purchased separately.

The way it works, I am told, is by analysing words into 41 different speech elements known as phonemes. It applies about 1000 'rules of English' to make sure it gets things right. So it can handle punctuation, abbreviations such as Dr, Mr, Mrs and figures like \$145.69 which it will duly announce as "one-hundred-forty-five-dollars and sixty-nine cents."

With such prowess presumably those little irregularities of our tongue which are the bane of English language students would be no trouble at all to Smoothtalker. I'm thinking of words like cough, bough and dough for example.

Much as I would have liked to try and trip up the synthesised salesman on the demo disk, I couldn't — it doesn't include the module for converting input into speech.

It did, however, run through the gamut of its talents: talked fast, talked slow; spoke high, spoke low; shouted loudly and whispered softly.

Anyhow, enough of technicalities. As I said, what really got me thinking were

the possibilities when its developers figure out how to incorporate a few of the subtleties of human speech. Those little nuances which make all the difference between 'hello' as in 'it's great to see you' and 'what do you want, nuisance!'

Then Smoothtalker could become cajoling or caressing, assertive or appealing, angry or amorous. Add to this capability some advances in those psycho-software products and a personal computer could become a personal friend, guide, guru and counsellor all rolled into one. It could spell the end of self transformation courses, cults, personality shaping schools, rebirthing courses and pseudo-psychologists of every hue.

Just sit yourself down in front of your friendly PC (which would of course greet you with a cheery "good morning/afternoon/evening John/Fred/Fredrika" or whatever as soon as you booted it up) and answer the questions yes or no, so the machine can suss out your particular hang-ups and instant therapy will spew forth from its speaker. Or you could plug in an under-pillow speaker, and remodelling of your psyche could be yours while you sleep.

If you think this is the stuff of science fiction — well I hope you are right, but on a more mundane level there's great potential in educational software. Rewarding positive behaviour and punishing negative behaviour are, according to educationalists, highly effective ways of getting people to learn things or change their behaviour, which is supposed to be the same thing.

Educational software seems to exploit this fact by playing tunes or emitting an electronic raspberry or showing a smiling face or a sad face. Software with synthesised speech could be so much more personal and congratulatory, or equally

personal and punitive. "No Peter, two and two does NOT make five".

Well I'm sure you could think of a dozen more applications. One thing's for sure, you'd never be alone with a Macintosh.

Perhaps the salesman who recently said to me that he could foresee the day when personal computers would be a substitute for pets wasn't as far off the mark as I'd first accused him of being. "They'll never replace cats" said I. Computers after all don't shed their fur, need feeding, have kittens, make a mess on the floor. And cats can't talk. But, and it's a big but, they are alive and computers aren't... yet.

Chris Kirkby

Pretty pics, but how useful?

It's pretty well known that the art of business graphics was reserved for the specialist until the PC came along. The products to produce all those fancy pie charts, bar charts, scattergrams, histograms, and what have you were enormously expensive and definitely not designed to be used by your average executive who just wanted to tart up his next presentation a bit.

The PC, Lotus 1-2-3 et al, colour printers and the Palette slidemaker have changed all that. Now anybody can produce the most stunning visuals with an outlay of less than \$A15,000. There's just one small problem: what do you really do with them? I mean, it's all very well to sock it to your managing director at your next presentation with lots of beautiful pics in every colour of the rainbow but if you are trying to tell him that you've made 200% of budget in the last quarter, are you sure he'll see the wood for the trees?

There's lots of rules about visual presentations, such as what colours are most effective, what sort of graphs best convey the trend you're trying to show and so on. These have been known to specialists for years, but they don't generally come bundled with your graphics software package.

Help is at hand, though, from the Australian Institute of Management. Next February the Institute will hold its first workshop on the use of computer graphics in business. The course costs about \$A200 and details can be obtained from the NSW Division, 215 Pacific Highway, North Sydney, NSW 2060. Tel: (02) 929 7922.

Chris Kirkby

Mistaken identities

In what appears to be a case of mistaken identity, Amust Computer Corporation Australia of 350 South Road, Moorabbin has continued to be confused with the company presently under official management called Amust Compak Manufacturing Pty Ltd.

To cite an example, just recently a realisation auction was held on behalf of the official manager of Amust Compak of plant and equipment used by them in the manufacture of their "Briefcase Computer". The auction was advertised in Melbourne newspapers and Amust Computer Corp. received some 40 phone calls from parties within and outside the industry enquiring as to viewing times to inspect the goods to be auctioned or when the company was to be liquidated.

Amust Computer Corporation is not the same as Amust Compak Manufacturing and Amust Computer Corporation has published disclaimers regarding any inferred relationship with Amust Compak.

New Sybiz software

Multi-user Sybiz integrated accounting software has been released for the 16-bit DOS operating systems.

The hub of the established single-user Sybiz is its general ledger module which receives postings from six other modules automatically. They are accounts payable, supplier orders, accounts receivable, inventory, order entry/invoicing and bill of materials. A report generator, payroll and advanced user module, which outputs data to popular spreadsheets, word processing and database packages are also available.

According to Sybiz Software none of these advantages are lost in Multi-user Sybiz as operating procedures on terminals remain unchanged.

Micro Fortran

Arcom Pacific has released Fortran, a full featured implementation to ANSI77 standard by Digital Research. It runs under CP/M-86, MS-DOS and PC-DOS. Fortran is particularly well suited for representing algebraic expressions for use in vector and matrix arithmetic and for solving problems requiring complex arithmetic.

Key features include: 8087 maths chip support and optimisation of small programs, overlay capability, extensive data type support, 64k element arrays, array subscript checking option, 40 character variable names and compatibility with other DRI products. Phone (07) 52 9522 for more details.

The story so far

The following is based on the 350 page Yankee Group

FRAMEWORK

Framework® is the first of a new generation of products that goes beyond today's integrated spreadsheets. It is an order of magnitude better than the original integrated products and windows.

The heart of Framework is a unique "frames" technology. Frames are actually self-contained, inter-related displays that can be nested, resized and relocated anywhere on the screen. Frames bring new flexibility to the way information is created and managed with a PC. With this truly three-dimensional design, the user can create infinite logical hierarchies of information, leading to as deep a level of complexity as needed for the task at hand. There is no limit to the number of frames that are active in the system. Framework's user interface is one of the most elegant designs yet conceived.

Word Processing

Framework's word processor is dynamite! It gives users the choice of frame or fullscreen viewing of documents, multiple margins within a single file, automatic justification and repagination, header/footers, page numbers and more. The streamlined menu system helps new users get started in a hurry and "shorthand" commands help veterans work even faster.

Outlining

The innovative and very powerful outline processor can be used as a standalone organizer or as a companion to the word processor. Using this outline mode, single ideas can be quickly captured and then expanded into fuller concepts and solutions. Any outline-frame or subheading within an outline can be instantly expanded to include text, spreadsheets, graphs or databases. Finally, with Framework, your PC is truly a thinking machine.

Database

Framework's database system can be learned quickly and put through its paces effortlessly because most commands are common throughout the entire program. Framework itself will handle most of your analytical information management needs, and if very large data handling is required, Framework is fully compatible with dBASE II®.

Spreadsheet

Spreadsheets are simple to create, use traditional row/column or English-language cell addresses, can be linked to automatically update other files based on cell data and have an exclusive international numerics feature that will change entries to accurately reflect changes in currency denominations including the placement of commas and decimal points.

Graphics

The graphics portion of Framework has been designed to produce exceptional charts and graphs on standard monochrome monitors. Six of the most frequently used business graphs are built-in and can be automatically drawn and updated from data in spreadsheets and database files.

DOS Access

The new DOS access capability allows any user to actually run other PC DOS software inside Framework. This allows users to gather data from other programs without quitting Framework. It will be of great help to people who frequently shuttle between programs and to businesses who perform frequent interchange of programs or data with larger systems.

Custom Applications

Framework comes complete with its own programming language. Users can begin writing their own custom packages or use software developers right away. In addition, dealers will continue to receive the excellent support that

has helped make Ashton-Tate the front-runner in the software industry with dBASE II and FRIDAY!

Hardware

Framework will run on the IBM PC, PC XT and all compatibles. It requires just 256K RAM and dual 360Kb floppy disk drives with monochrome display.

Availability

Framework will be available in Australia from the end of July. Contact your dealer end-June for more details or write to the Master Distributor, ARCOM Pacific, Freepost 2 (no stamp required), P.O. Box 13, Clayfield, Qld. 4011.

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ASHTON-TATE



Desk Top Computer Report, available to subscribers of the Yankee Group Research services:

The earliest indications that most Australians had of the impending personal computer revolution in Australia were a few articles in the press in 1978. Tandy began to make noises about its first rudimentary TRS-80 and the first news of the Apple-in-a-garage phenomenon had begun to leak through.

Hardly anyone took these rumblings seriously, considering the new machines to be little more than overblown calculators.

Then early in 1979, a few enterprising people organised a personal computer show in Sydney's Lower Town Hall.

The main machines on display were the Commodore PET, the TRS-80, the Exidy Sorcerer, and the Apple II. These four machines were to be the

mainstays of the early years of microcomputing in Australia.

The models on display were very basic, with very few peripherals in evidence. For example, no disk drives existed — all the machines were tape-loading. The standard of software offered was nothing more than a few vendor-produced programs written in rather basic Basic.

Even so, most people who attended the show could not fail to be impressed, because it was obvious that these machines were far more than calculators, and that a new era in computing was about to begin in Australia.

The biggest impetus to the local industry was given by Rudi Hoess who started the first Australian ComputerLand store in Sydney, and organised the first local Apple dealership. He franchised stores in other capital cities and by the end of 1979 had five stores, selling

mostly Apples. At the same time the Tandy and Commodore stores were expanding and Tandy successfully introduced the TRS-80 through its network of retail stores.

The Sorcerer, meanwhile, was selling reasonably well through Dick Smith's electronic stores. Definitely a machine for the hobbyist, it pioneered the ROM pack — solid state software which plugged into the machine. This idea still has validity today as a possible replacement for mechanical disk drives.

The Apple II dominated the market until 1981. Rudi Hoess expanded his organisation, and Apple grew as a product as more and better software and peripherals came on the market.

The microcomputer explosion truly began in 1981. The best indication of this is in the massive increase in computer stores in that year. ComputerLand outlets

doubled and the number of Apple dealerships trebled. Tandy began to organise more computer-only stores, and many independent dealerships sprang up.

Massive growth was the dominant feature of the Australian microcomputer industry in 1982. The market became overcrowded and discounting sent some of the smaller dealers to the wall.

The biggest personal computer show of 1982 was "Applefest", organised by Hoess's Electronic Concepts. It marked the high point of Apple's dominance of the Australian market. Apple established a corporate presence in Australia to prepare for the takeover of the local distributorship, which happened in May 1983.

January, 1983 began with the belated release of the IBM PC in Australia. This release was important for a number of reasons. Firstly, it legitimised the personal

HI-TECH C

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Program: Primes (Eratosthene's sieve)

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Whitesmiths	60	420	15745
C/80	63	140	3584
Aztec	78	144	9168

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computer. The entry of the world's largest computer maker into the fray brought new respectability to the small computer market. The strength of IBM as a company made the IBM a de facto standard.

After the announcement of the IBM PC, software developers began to write for the new 16-bit standard. Many companies felt obliged to follow IBM's wagon, and develop "IBM compatible" machines.

The APC Shows from *Australian Personal Computer* and Australian Exhibition Services dominated the market, attracting crowds of 25,000 plus in Sydney and Melbourne.

May 1984 saw the introduction of the 32-bit Apple Macintosh, the first easy-to-use consumer oriented computer with a 'pictorial' operating system.

At the end of 1984, more than 140 brands of personal computer were available on the Australian market. The majority of new offerings were "IBM compatible" 16-bit machines.

In November, 1984, Digital Research, the originator of the first, and most popular personal computer operating system,

CP/M, announced a new product: a common Macintosh-type easy-to-use pictorial user interface for all MS-DOS machines. Digital Research claimed this removed the need for strict IBM compatibility suggesting a more creative opening for computer products in 1985.

November also saw the introduction by Telecom of an integrated communications and computer device containing keyboard, screen, micro drives, telephone, telex, videotex, communications and voice synthesiser. ComputerPhone pointed the way to the desktop machine of the future decade.

AAP introduced the first microwave service for personal computer users.

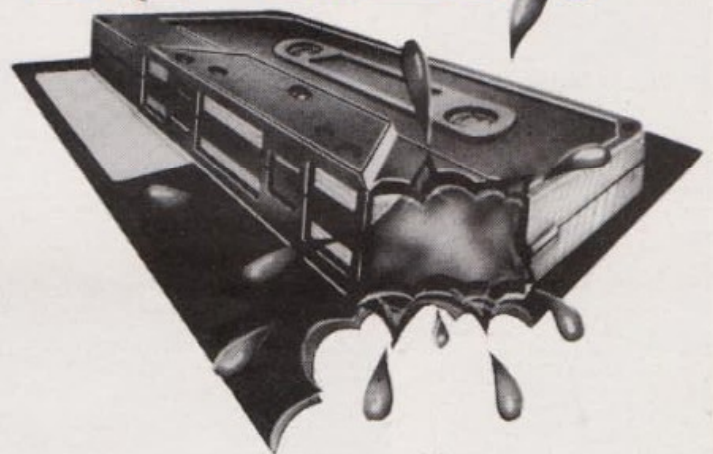
The Aussat satellite was oversubscribed, and the launch of the third satellite was put forward to 1986.

Telecom announced Viatel, Australia's videotex service, and three private companies followed suit.

New personal computer software arrived on the Australian market at a rate of 100 products per month during 1984.

Laurel Allen

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ComputerPhone



BENCHTEST

While Telecom has created a stir by entering the PC arena, its ComputerPhone could be the busy executive's dream come true. It allows several applications to run simultaneously, talks to telephone callers and features microdrives — to name just a few of its impressive capabilities.

David Tebbutt presents this exclusive test.

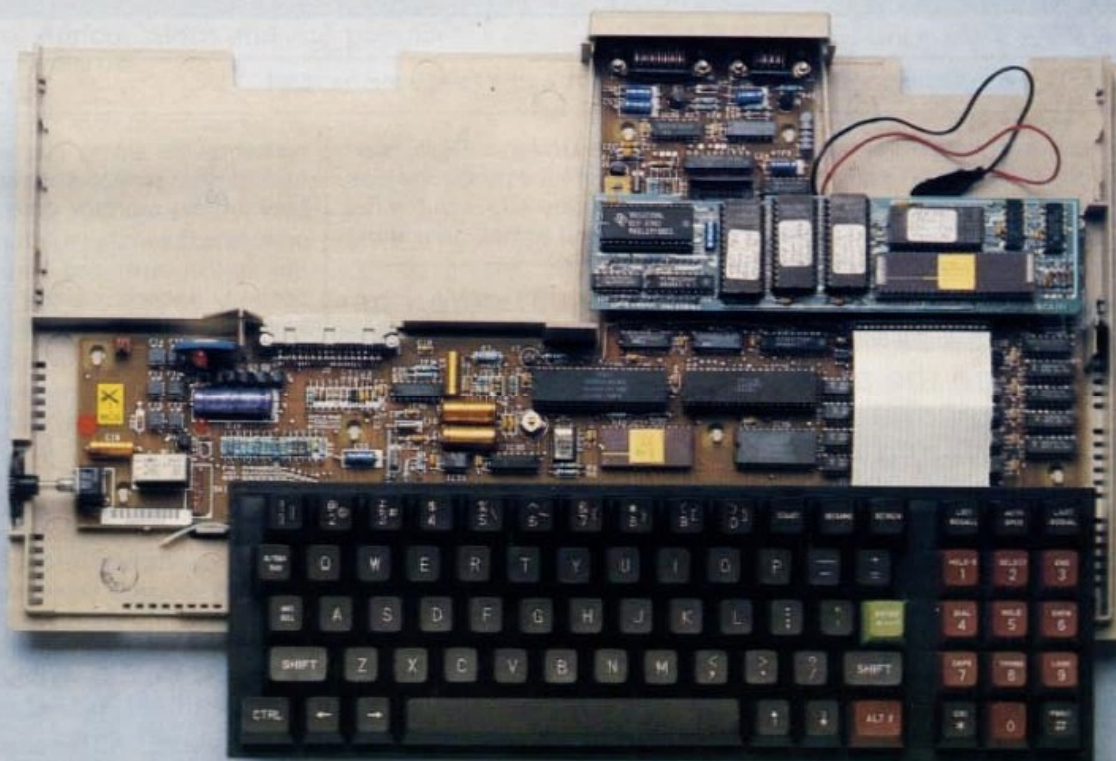
What does your average busy professional do all day long? I'll tell you. He dives from task to task, taking phone calls, dashing off letters or memos, calling people and generally looking totally disorganised.

In fact, such a person is well in control and is capable of responding rapidly to changing circumstances and altering priorities accordingly. Unfortunately, most computers can't keep up with such a person. They prefer to grab you for an application and hold you there until a job is finished. Integrated programs like Symphony or Framework help considerably and the more recent development of background tasks (calculator, calendar, notebook, and so on) will bring computers much closer to an executive's needs.

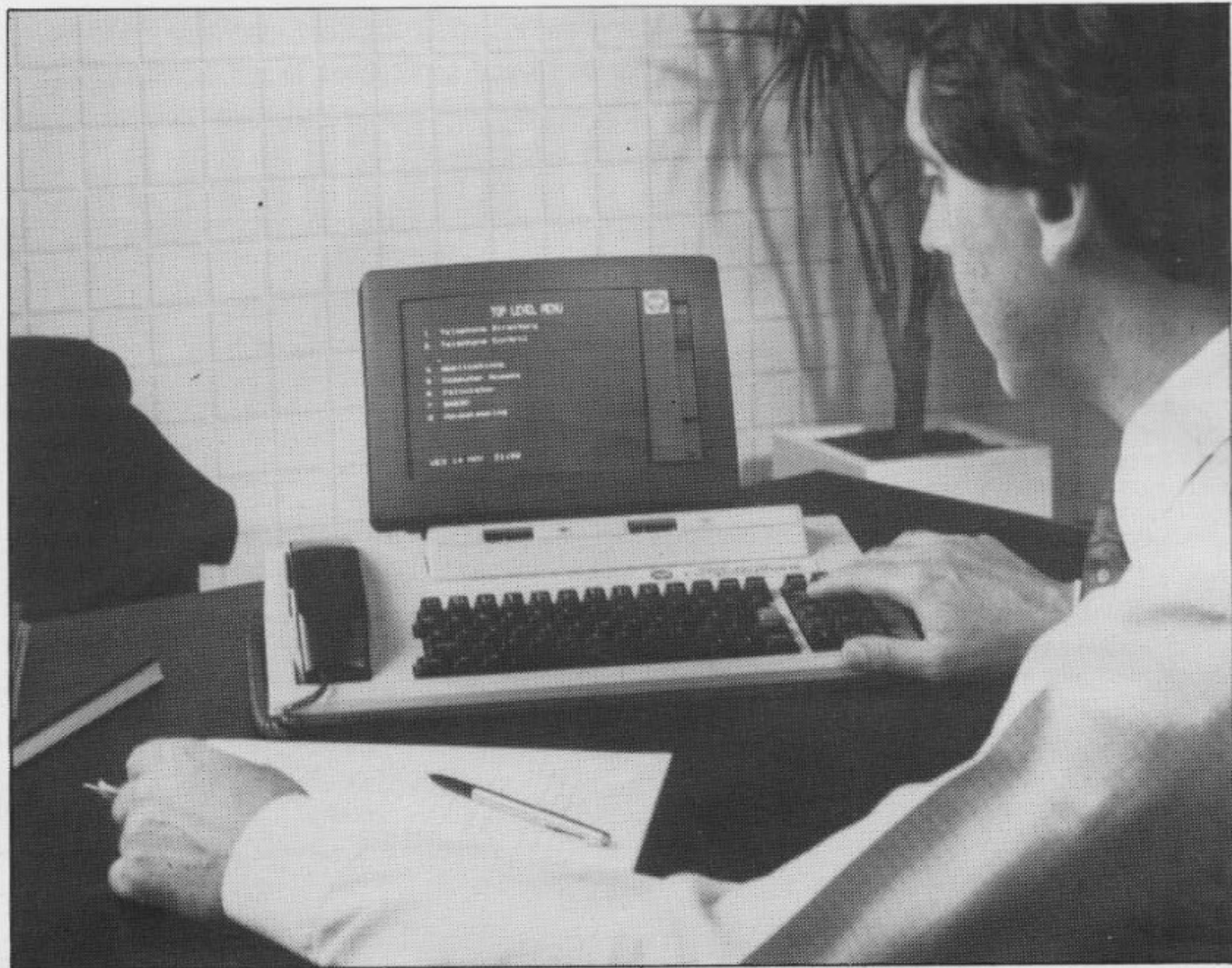
Imagine a computer that lets you run several different applications 'at the same time', takes up less space on your desk than the average personal computer, replaces your telephone for both voice and data calls without interfering



Side view: the monitor is adjustable and fits snugly to the machine



Two Sinclair chips sit on the main PCB with the processor, ROMs and speech synthesiser chip on a smaller board



The standard qwerty keyboard incorporates a pair of microdrives and a telephone handset

with other applications, and chats to your callers when you're out. Interested? I certainly was when Telecom's ComputerPhone arrived.

the name (OPD = One Per Desk) survived in the UK where the product is also being marketed (but by ICL), but the flat screen was discarded somewhere along

Imagine a computer that lets you run several different applications 'at the same time', takes up less space on your desk than the average personal computer, replaces your telephone for both voice and data calls without interfering with other applications, and chats to your callers when you're out.

The amazing thing about this project is that it's been kept so quiet despite numerous mentions a couple of years ago. Here's a quote from a 1982 Sinclair press release: 'In December 1981, ICL announced that it was to develop with Sinclair Research an ultra low-cost integrated terminal/digital telephone workstation employing Sinclair's flat tube technology and Sinclair Basic. At the time it was christened the "One Per Desk IT Work Station". The Basic and

the way. The microdrives used for backing up the memory are a visible reminder of Sinclair's involvement, but the predominant influence is clearly ICL's.

Hardware

The ComputerPhone comprises two units — a monitor and a keyboard unit incorporating a pair of microdrives and a telephone handset. To avoid the need for a cooling fan and to allow continuous

operation for up to five years, ICL has tucked the power supply away in the back of the monitor unit. A single lead connects the units together, and this carries both power and control signals. A second socket at the back of the keyboard unit allows the attachment of an RS 432 printer.

The colour scheme is chocolate and cream with burgundy telephone control keys and a lime green ENTER key. This is a good idea because the ENTER key is quite puny: it's been made the same size as the letter keys to help make room for special control keys. Six LED windows indicate whether power and the screen are on, which telephone lines are active and which microdrives are in use.

The machine has no power switch but, in view of its continuous use, has a screen on/off switch to preserve the tube's life. In addition the screen will blank after five minutes of inactivity in order to protect the phosphor coating. A loudspeaker permits call monitoring without lifting the handset. The handset

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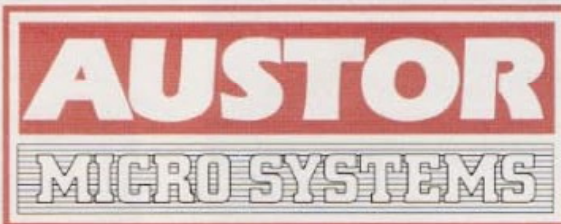
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must be used if you wish to speak — there's no microphone in the machine itself.

The keyboard, or control unit, comprises three modules — the main unit, the telephony module and the ROM module. The main unit contains the processor, memory, operating system ROMs, most of the control circuitry, the microdrives, the keyboard and a numeric keypad. The telephony module plugs into the rear left of the main unit, and has two telephone leads and the handset trailing out of it.

The ROM module slides into the rear right of the ComputerPhone and contains two sockets into which plugs applications software: for example, the messaging software. The ROM pack also contains Psion's Xchange suite of programs which are tucked away inside the pack on five ROMs of its own. When faster one-megabit ROMs are available, the number of ROMs needed for Xchange will be reduced and the ROM pack will allow the addition of up to four additional plug-in applications. Plug-in modules can be 8-, 16- or 32k each.

This is the easiest machine I've ever taken to pieces. The only screw was in the telephony module and I'm not entirely clear what it was doing there anyway. The top of the main unit is held to the base by nine concealed plastic clips; a slot allows you to insert a screwdriver and lever off each clip. It takes seconds and is designed for rapid replacement of damaged or faulty components.

The connections between the upper and lower parts of the assembly are the

14-pin microdrive connector, the handset switch leads and the loudspeaker leads. The keyboard lies over the front part of an oddly-shaped PCB (at least, I'm calling it the main one because it's the largest). In fact, the processor, four ICL system software ROMs (32k each) and the TI-TMS5220 speech synthesiser are on a separate smaller board 'piggy-backed' onto the first. Two Sinclair-designed chips sit on the main board (sounds like a business machine, doesn't it?) and, of course, the microdrive ULAs are Sinclair's too. The three Sinclair chips and the Motorola 68008 processor are the same as those used in the QL. The main board contains 128k of main memory on 16 chips. An additional 2k of static RAM contains essential system parameter information, and is backed by a lithium battery designed to last at least five years. A further ROM contains the vocabulary for the speech synthesiser. Apart from such things as a volume control and a piezo electric speaker, that just about covers the main ingredients.

The upper part of the assembly contains the loudspeaker, the handset on/off switch and the microdrives mounted on their own separate assembly. I must confess that I approached the microdrives with some trepidation, but they worked reliably.

The keys are well laid out and of normal pitch. The keytops are dished and have a slightly bumpy surface which makes them pleasant to touch. The technology underlying the keyboard is not a million miles from its much-hated rubber membrane relative: each key

rests on a rubberised plastic 'bubble'. The bubble is securely trapped by a plastic surround attached to the keyboard PCB. This bubble doubles as a spring and, presumably, as a connector. The keys automatically repeat after a short pause and a hefty 128k Basic keyboard buffer is provided. This keyboard is designed for low to medium use over the product's lifetime.

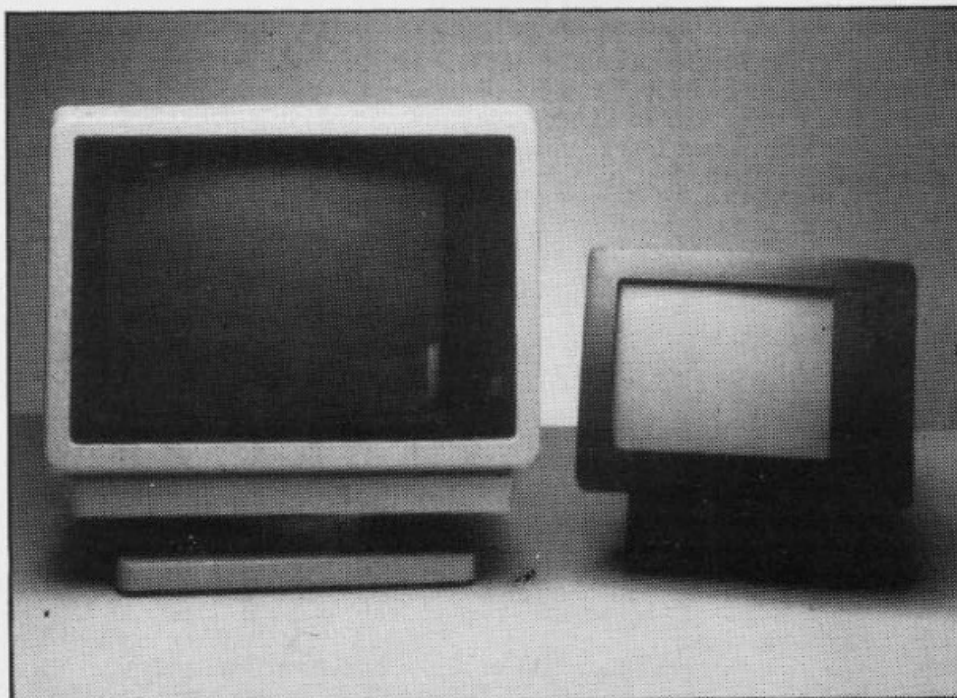
The qwerty keyboard is standard but there are a few differences. For example, the numerics on the top row each have three characters inscribed on the key top; the third is accessed by holding down the ALT key while pressing the numeric. INS and DEL are provided on a single key; they open a gap in the current line and delete the character preceding the cursor respectively. If you press CTRL with this key, it deletes characters to the right of the cursor and closes up the gap. TAB and BACK TAB are provided on the same key and are used to move between 'boxes' on data entry screens. The cursor keys are to either side of the space bar.

Now for some new keys: START, RESUME and REVIEW are specific to the ComputerPhone. Because it lets you run several tasks at the same time, these keys, in conjunction with ICL's firmware, allow you to get out of something (START), get back into whatever you left last if it's still there (RESUME), and find out what tasks are going on at the same time (REVIEW). This last function gives a menu of all active tasks and you can elect to go into any one.

Over on the right is the numeric keypad which comprises fifteen keys and works in conjunction with SHIFT and ALT. In this context ALT turns the numeric keys into function keys and, as a reminder of this, has a lower case 'f' inscribed on it. I have always thought that separate function key pads are an irritation, just something else to learn, but ICL's answer is so simple I'm astonished that I've not come across it before.


The numbers are laid out in the same way as a touch-tone telephone: that is, with 123 at the top. Since this computer is so closely linked with the telephone system, ICL has made the right decision. Two keys on either side of the zero contain videotext special characters, asterisk and hash; the shift positions of these keys contain ESC and PRINT respectively. The first we know, the second performs a screendump to your printer.

The remaining keys all have some function connected with the telephone system. Here's the top row: LIST shows your important phone numbers; RECALL has the same effect as RECALL fitted to some telephones; AUTO lets



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you switch a data call from the handset to the modem; SPKR initiates a 'hands off' call or transfers a call to the loudspeaker; LAST displays the last six numbers dialled and redials your choice; and REDIAL redials the last number dialled. Of the remaining seven, HOLD-S holds a call and transfers you to the other line; SELECT switches your preferred line;

line. However, it's possible to put one voice call on hold while dealing with another. The board is designed for analogue communication, but a digital board is under development to be ready when digital communication becomes more established. Auto-dialling and auto-answering facilities are also provided.

The amazing thing about this project is that it's been kept so quiet despite numerous mentions a couple of years ago.

END ends a call and starts a new one, or connects you to a call on the other line; DIAL connects/disconnects the numeric pad from the telephone (presumably so you can use it in a program); HOLD holds a call; CAPS (what's that doing *here?*) locks the keyboard in upper case; and TIMING starts timing a call or lets you enter a charge band code.

The screen has a maximum resolution of 256 x 512 pixels, which gives a choice of four colours (or shades of grey) — black, white, green and red. Using a 256 x 256 resolution, the number of colours is doubled to eight and you can make the pixels flash too. In normal use the screen is laid out as 26 lines each of 80 characters (alternatively, each line can contain 40 characters). The top 24 lines form the main display area and the bottom two are referred to as the 'Noticeboard', where the system status messages appear. Since many things may be happening at the same time, these last two lines are essential.

The machine I tested had the standard 9in monochrome monitor, but a 14in colour monitor is also available. The monitor has a two-position pair of legs at the front. One position has the monitor lying almost flat on the desk but it's all still visible behind the sloping main unit; the other position raises the monitor so that it may be pulled close to the main unit where it fits snugly just behind the microdrives. This latter position also tilts the screen backwards and makes it more natural to use. Apart from the screen protection facilities (on/off and auto-blanking after five minutes), the monitor has a slider control for brightness and two LEDs — one to show that the tube is still powered, the other to show that the mains power is connected.

The telephone module is controlled by a Frequency Shift Key (FSK) modem and can handle 1200/75 baud for Viewdata connections, 1200/1200 half-duplex and 300 baud full duplex. It can also handle two telephone lines at once, and with only one modem and one handset, these will normally be a data line and a speech

The speech synthesiser and its associated vocabulary is used to construct messages which can then be broadcast through the telephony module when set in auto-answer voice mode. Auto-answer data mode allows the reception and storage of data without user intervention.

System software

The Sinclair QL has an operating system called QDOS which is intimately related to QL Basic. In fact, I think they may even occupy the same ROM on that machine. ICL has written its own operating system software and accordingly has had to prise the Sinclair Basic away from QDOS prior to building it into the ComputerPhone.

ICL is aware that a large amount of third party software will be written for the QL, and will therefore be trying to make the two languages as compatible as possible. ICL will also want to make its own operating system resources available to Basic programmers, so I expect the Basic to be completely compatible with QL Basic.

The ComputerPhone user will be very taken with the 'operating system' provided with the machine. To call the ICL software an operating system is rather insulting. ICL calls it the Base Functional Software as it not only controls the essential functions of the machine, but also provides services which the user can invoke in order to access the various applications available. Briefly, the elements of this system are as follows: Kernel, Director, telephone handler, telephone directories, calculator, screen image printing and field editor.

The Kernel is what we normally call an operating system: it manages the nuts and bolts and provides a logical map of the hardware devices. Input, output, memory allocation, device control and interrupt handling are the main tasks of the Kernel; and everything is, of course, invisible to the user.

The Director is a higher-level piece of

software which comprises two elements — the applications handler and the telephone handler. The Director schedules activities so that they don't trip over each other in their bids for machine resources. Guidelines exist for software authors and, providing they obey the rules, the Director and the Kernel will make sure that no contention problems arise. The Director takes care of those strange keys I mentioned earlier, START, RESUME and REVIEW, and is always in control of what application is where, what resources it's using, and what state it was in when it was last active.

The telephone handler part of Director keeps track of the calls which have been requested by the various applications, the status of each line and the management of voice and data calls through those lines. Auto-dialling, line switching and connection of the speech synthesiser are handled by this part of the software, as is the reporting of the telephone system status to the Noticeboard at the foot of the screen.

ComputerPhone contains two telephone directories — one for computer services and the other for voice calls. The directories can be searched by keyword or partword, browsed, used to automatically dial a number and saved to microdrive. The user can create and amend directory entries, and load and merge directories from microdrive. All these facilities are directly available to the user from a series of menus.

A simple calculator is provided which handles up to 16 digits (plus decimal point and sign). Calculations are to eight decimal places and the normal +, -, *, /, = and % facilities are provided. In addition, a number of memory commands are included but, frankly, the calculator is nothing to write home about. It's on a par with a credit card calculator, with the additional benefit that you can see the details of earlier calculation scrolling up the screen as if they were on paper.

The screen image printer literally freezes the screen when the button is pressed and dumps the image to the printer, and is obviously useful if you've encountered an interesting videotext or electronic mail page.

The field editor provides cursor positioning and text editing controls, giving the user a consistent approach to data entry and amendment tasks.

All the foregoing functions are built-in to enable applications programmers to provide a consistent user image in their programs.

For the ordinary user, all the system's facilities and supplied programs are presented through a series of menus. Although you may lose track of yourself

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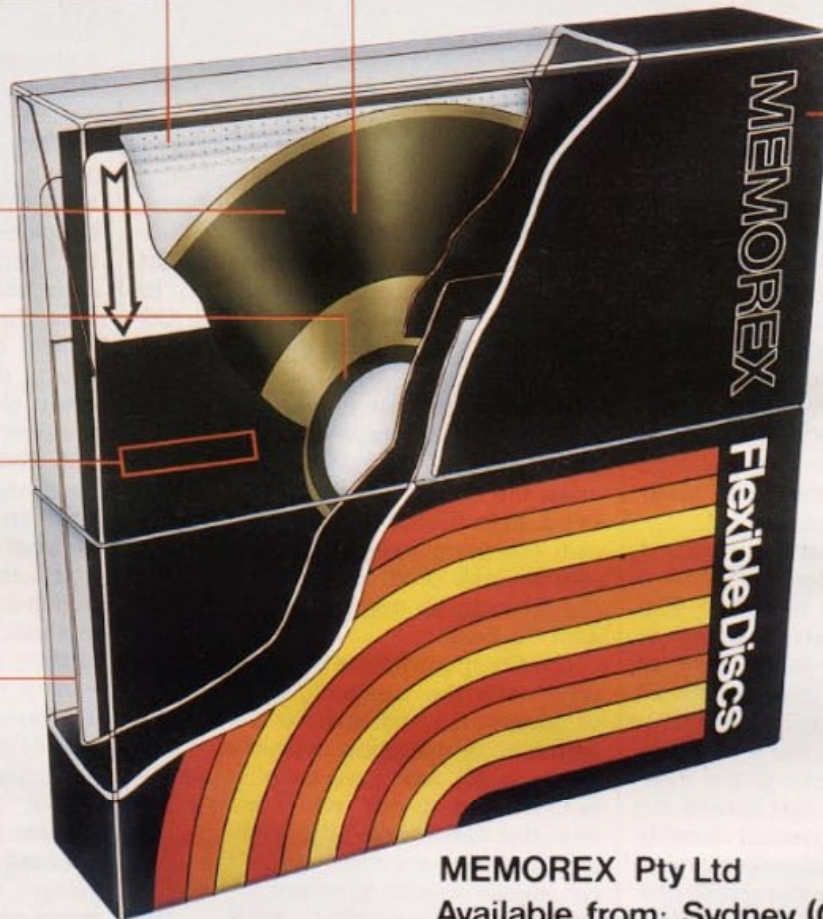
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from time to time, you can always get back to the main menu by pressing the panic button — the START key. The main menu comprises the following options: Telephone Directory, Telephone Control, Messaging, Applications, Computer Access, Calculator, Basic, and House-keeping.

The Telephone Directory option conceals a lower menu which allows you to create and amend directory entries, save and load them via microdrives, search for an entry by keyword or part-word, display the current entry, and make automatic calls. You can store two numbers for each person — one data, the other voice. Extension numbers may follow the telephone number for display onscreen while the call is being put through. The only trouble is that when you lift the handset to ask for the extension; you need to use your own short-term memory.

The Telephone Control option allows you to examine the status of your telephone lines (free, ringing, answering, and so on) and the last number called. The fun starts when you want to set the ComputerPhone to automatically answer voice calls with its built-in speech synthesiser.

A selection of some two hundred words is offered and to create a message you simply type it using these words. If a word is unrecognisable to ComputerPhone it will highlight the wrong word so that you can change it. Endings such as -s, -ing and -ed may be appended to words and letters, numbers and dates (1st to 31st) may be included. A sentence like: 'I am sorry, I am out. Please call my secretary on extension "328". Thank you.' is quite feasible. If you're the imaginative sort you could cook up

something like: 'I have gone for a we-we. Back soon.' Full stops, spaces and commas provide pauses of varying lengths. It works, it's fun and you can't be in any doubt that you're being answered by a computer.

You can set a time window for auto-answer and automatically switch to an alternative message outside that window; a repertoire of up to sixteen messages may be stored in the ComputerPhone. If you want the phone to ring for 14 seconds before your Dalek answers, then that can be arranged too; this gives people a chance to hang up when they realise you're not there. Other features of Telephone Control allow you to time calls and let ComputerPhone work out approximate call charges.

The plug-in ROM capsule covering Messaging is a kind of electronic mail facility which lets you create memos, messages or whatever in a 'notebook' on your ComputerPhone. You pop it into the electronic 'out tray' where it waits to be transmitted to its destination. Transmissions take place without your intervention and, when you arrive in the morning, you may well find a stack of messages in your electronic 'in tray' which can be transferred to your notebook, printed out or simply destroyed.

The Applications option clearly depends on what you have plugged into your machine. On the review machine it offered a cartridge menu which told me which programs were available from the microdrive, statistics relating to the microdrive's performance and access to Xchange, the suite of applications programs.

Computer Access lets you maintain a file of computer phone numbers and

access details in a similar way to the voice Telephone Directory mentioned earlier. It allows automatic or manual connection using Viewdata or Teletype conventions. Pages of data may be stored for later printing and protocols can be tucked away on its Profile Store. I tried one network but was denied access — someone may have changed the password. The auto-dialling, the connection and the sign on worked perfectly though.

I had more success with a videotext service and suffered the usual experience of profound disappointment with what was there. I saved pages and displayed them after I had disconnected, and it pleased me to think that I was cutting down on my phone bills by using the facilities in this way.

Finally, the Housekeeping option allows you to check the battery charge, set the time and date, save and load important bits of store and mess around with the microdrives. Format, copy, rename, display and delete are among the utilities provided.

Applications software

Included with the ComputerPhone is the Xchange suite of programs. This comprises the four most popular applications — spreadsheet, business graphics, word processor and database. Called Abacus, Easel, Quill and Archive respectively, they are similar to the versions offered on the QL and the popular MS-DOS machines in the UK.

The programs offer a perfectly adequate set of facilities, and any minor niggles (especially the need to type Archive commands in full) are overcome by their low price. Because the Xchange applications are held in ROM and treat RAM as if it were a microdrive, the loading of programs and exchange of information is impressively fast. You can, of course, specify the microdrives for data storage when things do slow down; the trick is to make your telephone calls while the drives are busy. You can get into other activities but, sooner or later, they suspend the microdrive activity.

ICL is looking for other software but, at the time of writing, it either hadn't found what it was looking for or was keeping quiet about its plans. As I mentioned earlier, the company is aiming for compatibility with software offerings destined for the Sinclair QL.

Documentation

The ComputerPhone is supplied with the following manuals: *Installation*; *Hand-*

Technical specifications

Processor:	68008, 7.5MHz
ROM:	128k integral 208k ROM pack
RAM:	128k dynamic 2k static (lithium battery-backed)
Mass storage:	Two microdrives, minimum 95k each
Keyboard:	73 keys, qwerty plus telephone-style numeric pad
Monitor:	9in monochrome
Size:	Control unit, 95mm x 440mm x 250mm Monitor 250mm x 280mm x 280mm
Weight:	Control unit, 3kg Monitor, 4.75kg
I/O:	Nine-way RS432 serial connector
Modem:	1200/1200 half-duplex, 75/1200 and 300/300 full duplex
DOS:	Proprietary
Bundled software:	Telephone directories, control, communications, utilities, calculator, Basic, Xchange
Peripherals:	Printer, 14in colour monitor

In perspective

A single glance at the ComputerPhone betrays its pedigree. The Sinclair microdrives peer at you over the top of the keyboard. Inside you'll find three Sinclair-designed chips and the Basic is adapted from Sinclair SuperBasic. Having said all that, the rest of the design is definitely ICL's. The system software has been written by ICL to handle a wide range of tasks concurrently — exactly what the busy professional needs; access to these facilities is through a series of simple menus.

With its built-in voice and data telephony system, the ComputerPhone is clearly distanced from the run-of-the-mill desktop computers. It has been said that the few square inches on the top of the executive's desk are the most valuable piece of real estate in the world. The race is on for that space and Telecom is in with a very good chance of leading in the first lap. At \$2,950 this product represents good value. Looking around the market-place it is difficult to decide which machines to compare it with; because there's nothing like it the choice is limited. Most people will need two telephones, a modem, a personal computer and a pile of software packages to match the ComputerPhone's facilities.

An IBM PC plus RS232 board, modem and integrated packages such as 1-2-3 or Symphony would certainly be more than a match for it. But at what cost? The microdrives put a limit on data storage, but many users wouldn't notice this.

There isn't anything available in our market which compares with the ComputerPhone. You're on your own with this one. Go out and put all these facilities around any personal computer and you'll probably find that when you price it you'll wonder why you bothered.

While the question of whether a semi-government body such as Telecom should be permitted to compete in the market-place is not strictly part of a Benchtest, some comment is called for:

When questioned at its launch about why Telecom was selling such a product, a spokesman said that the ComputerPhone was servicing a part of the market not being covered by existing products, such as telephones and PABX systems and that it was inevitable that there would be overlap with the PC market.

To confine ourselves to Telecom's argument, it is, by implication, describing the ComputerPhone more as a phone/communications device than a computer — otherwise there would be no spokesman stating the inevitability of 'overlap' with the PC market; it would not be a case of unintentional overlap but one of direct competition. A description of the machine is obviously open to subjective opinion and it is our's that the ComputerPhone's pedigree is clearly the personal computer.

Just as the law must be seen to be upheld, so it would have been wise for Telecom to encourage such a product in the Australian market-place but leave the marketing to someone else (and why not ICL?). As it stands now, Telecom has left itself open in the long- and short-term to claims of vested interests in a whole spectrum of its activities.

book; *Basic*; *Messaging*; and *Welcome Package*.

The manuals are well laid out and well written, although I did feel the need for a road map from time to time. The problem lies less in the manuals than in the complexity of the subject being tackled. This is a very sophisticated machine and ICL has tried very hard (and very successfully) to hide this from the user. Because the manuals have to cover the subject thoroughly there's a danger of getting bogged down, so my advice is to read as little as possible and use the machine as much as you can. As you run into gaps and apparent inconsistencies, that's the time to study the manuals.

The *Installation* manual is approximately 25 pages which tell you clearly what to do to get your ComputerPhone going. Read it — you must. It's a model of

clarity and about 50 per cent pictorial.

The *Welcome Package* runs you through a series of 'typical' activities using both a microdrive cartridge and the

Welcome book. The cartridge is the easiest way to get a feel for the software if you'd like a little theoretical learning before properly using the machine. The accompanying manual is thorough but makes machine operation look more complicated than it actually is.

The *Handbook* tells you everything you're likely to need to know about the ComputerPhone, but is a book dipped into rather than read straight through. It's clearly written but once or twice I found it guilty of 'forward referencing' — it mentions things before it's explained what they are.

The *Basic* manual is utterly comprehensive and can be used equally well by a novice or an expert.

Prices

Telecom is offering three 'packages'. The first includes the ComputerPhone with the mono screen, Xchange and messaging software and a pack of ten microdrive cartridges; it will retail for \$2,950 including sales tax. The second package is the same as the first but includes the four colour printer and will sell for \$3,600. The third offering includes the printer and the colour monitor and will set you back \$4,400.

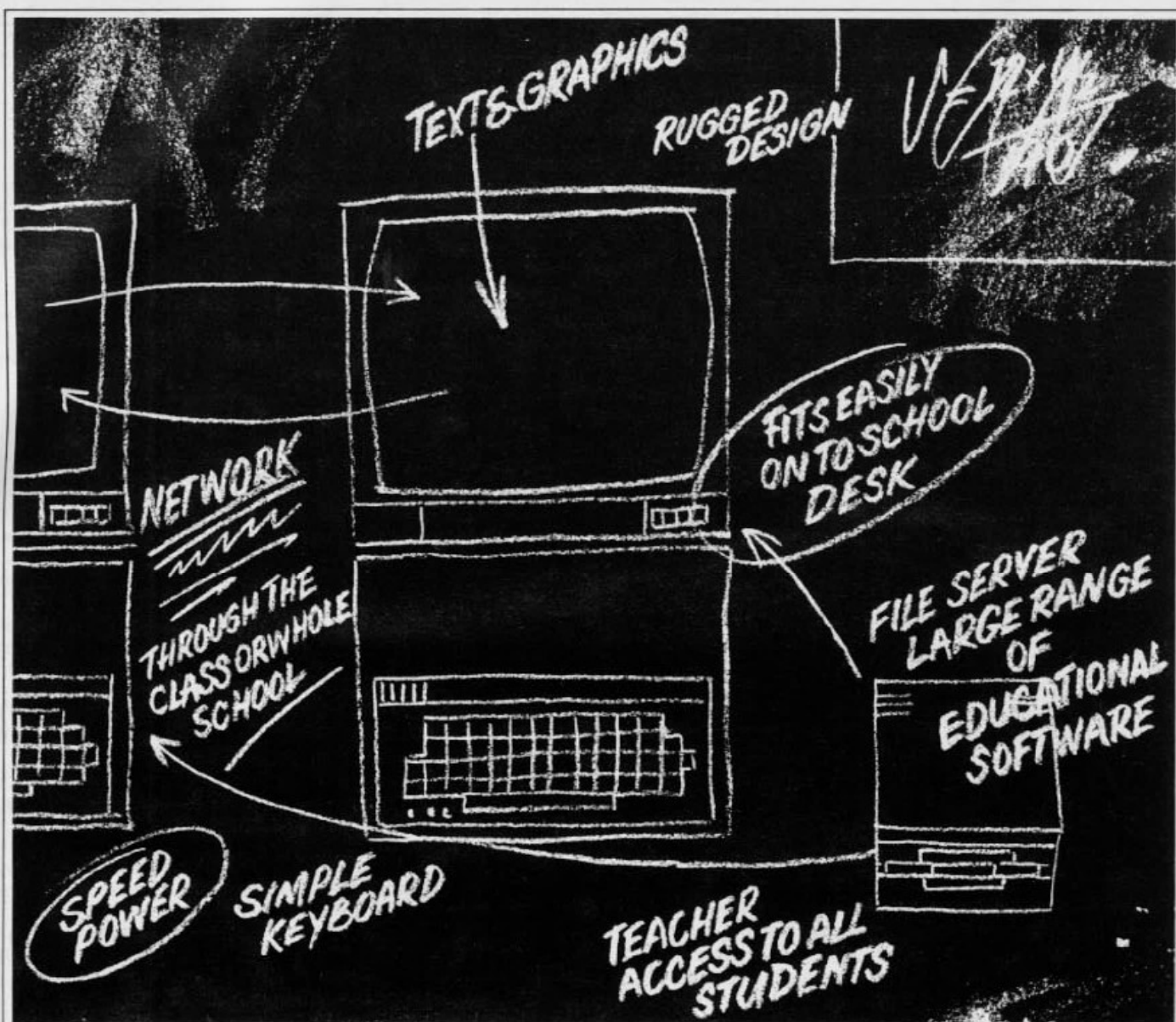
The ComputerPhone is scheduled for release in February and will come with a two year warranty.

Conclusion

The ComputerPhone is an excellent concept. It grabs a corner of the desk and, with the Xchange software, takes care of most of the professional's data processing and telephone needs. By allowing several tasks to be operational at once, the ComputerPhone comes very close to matching a user's rather erratic way of working.

The price is excellent and I suspect that, for a few months at least, Telecom will have the field to itself.





The only computer that was designed in a classroom, not a factory.

If you want to find out how suitable a computer is for your school, ask where it was designed.

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The classroom, by the way, was at Cambridge University.

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The BBC school computer.

For more information on the BBC microcomputer and the new compact version, the Electron, send this coupon to: Barson Computers Pty. Ltd. 335 Johnston St., Abbotsford, Victoria 3067, or 7 West St., North Sydney 2060. Or phone Barson Melbourne on (03) 419 3033 or Sydney (02) 957 2588.

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BARSON COMPUTERS

Drawn by Graham & Kelly 1981/06



Our US reporter has encouraging news for word processing users, and announces tough competition in the disk market.

Taking the stage

December 1984 saw the worldwide debut of WordStar 2000, a complete rewrite of the old WordStar. The new features look like a wish list from every word processing user in the world: a three-window screen, footnoting, multiple-line headers and footers, proportional spacing, a glossary key, sorting, spelling checking, an UNDO command, built-in calculator functions, and much more. Micropro claims that the package will be easy to use — something that WordStar has never been — and that first-time users will be up and running 'in a few hours'.

WordStar 2000 will sell for \$495, or half that (\$250) if you upgrade from the old WordStar. An advanced version, WordStar 2000 Plus, with menu-driven telecommunications, mailing list database and an indexing feature, will sell for \$595 (\$350 with a trade-in). The initial version runs only on the IBM PC and 100 per cent compatibles, but there's no 8-bit machines: Micropro doesn't see that as a major future market.

This delights the people at Newstar Software (formed by former Micropro people). Newstar's improvement on WordStar, NewWord (functionally equivalent to WordStar 3.3 with MailMerge plus a few additional features) has been struggling for recognition for over a year. NewWord costs \$249, half the price of WordStar, and is available for both 8- and 16-bit machines.

The floppies are retaliating!

Three leaders in audio compact disk technology have invaded the computer

field, but floppy disks are retaliating.

Denon, Philips and 3M have announced the development of a CD-based optical ROM system for computers. A single 4 $\frac{3}{4}$ in CD ROM has a capacity of over 550Mbytes, about the equivalent of 500 double-density floppy disks. In addition to offering efficient storage, this enormous capacity also provides the opportunity to store high resolution graphics along with standard ASCII data.

Moreover, the ruggedness and reliability of the optical CD ROM disk and its drive mechanism is said to far exceed that of conventional magnetic media — floppy disk or hard disk.

Meanwhile, Compusonics of Denver has invented a digital machine that records music on ordinary magnetic floppy disks and hard disks. The professional model (\$35,000) records up to one hour on a hard disk, but the company plans to launch a \$1200 home unit that can record up to 45 minutes on a floppy disk. McIntosh Laboratories, a maker of high-end audio gear, also plans to make a floppy disk recorder using Compusonics' technology.

Random bits

IBM is overwhelmed with orders for the AT. Dealers have been put on allocation and the lead time to get a system is now about three months... IBM has also bought a bunch of Japanese MSX computers, peripherals and software from Quest Publishing, a group of former SpectraVideo employees — I wonder why?... An apologetic letter from vice president Steve Ballmer of Microsoft discloses a further delay in the shipment of Microsoft Windows from November 1984 to June 1985. Apparently the designers are having problems with speed, graphics capabilities and reliability... Microsoft isn't alone. Gordon Mustain of Rising Star announced yet another delay in the release of

Valdocs 2.0 for the Epson QX-10 to increase the speed of the word processing module and add additional features...

Film giant Eastman Kodak has entered the floppy disk business. Initially it plans to resell disks made by Dysan and several other domestic and foreign producers, prior to producing its own media in Guadalajara, Mexico...

Hotels are becoming more responsive to the needs of modern business travellers. For example, the Hyatt Regency in Chicago rents an IBM PC (and software) for \$6 per hour. In Minneapolis, the Omni Northstar rents an IBM PC and printer for \$10 per hour; Lotus Symphony costs an additional \$10... Having lost \$3 million in the first nine months of 1984, Management Science America (MSA) has put Peachtree Software up for sale. So far, no takers. Peachtree recently bought two educational software publishers, Edu-Ware and Design Ware but killed off the Edu-Ware label. Now, Design Ware plans to re-introduce the label... Deserting the ship? Ronald Mickwee, chairman of Eagle Computer, recently sold his entire stock holdings of 128,500 shares... Doubleday paid one of the biggest advances ever for a computer book, \$1.3 million, to Stewart Brand for the Whole Earth Software Catalog. To make money on the deal, Stewart expects Doubleday will have to sell more than 500,000 copies. I'd be surprised if it touches 100,000... Rumours: VisiCorp will merge with a new Sunnyvale-based company, Palladin, and founders Dan Fylstra and Peter Jennings will not have a role in the new company... Apple will discontinue the Lisa line in 1985 and concentrate on the larger Macs plus a new 16-bit Apple IIx.

Sinking or swimming?

Awash in a flood of red ink,

Otrona Advanced Systems terminated all 175 remaining employees in late October 1984. About the Otrona 2001 transportable IBM PC compatible, president James Lindner said: 'We could sell it, but were unable to build it at a profit.' The managers planned to liquidate the company rather than file for reorganisation under Chapter 11.

Franklin Computer, which had been operating under the protection of Chapter 11, has been unable to find a buyer or merger partner and will liquidate its assets and cease operations.

Stearns Computer Systems in Minneapolis, maker of an 8086-based desktop system, announced a layoff of 14 employees last October. The firm had previously laid off 30 workers in the summer of 1984. On the bright side, the company announced it had become profitable as of September 1984.

Knoware Inc, founded by two MIT professors, marketed an interesting software package that purported to teach executives how to climb the corporate ladder by learning how to use their personal computers. Apparently it wasn't well received, and Knoware recently filed for liquidation.

Handwriting on the wall? In June 1984, Rodney Zaks of Sybex Computer Books invited 20 notable computing pioneers to Pioneer Days in San Francisco. It was a gala media event. Then, three months later, each of the pioneers received a letter from the credit manager of the Hyatt Regency which said: 'Sybex has not paid for your account and your charges have been placed on your personal credit card.' Pretty shabby, Sybex.

For a games software maker the busiest season is before Christmas, but that was when Activision laid off 30 more workers. In just a year, the workforce has decreased from 400 to 150. President James Levy expressed hopes that the bottom has been reached and the market will rebound. **END**



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Obviously, every student lucky enough to have access to a BBC computer is going to learn about computers.

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Hundreds of educational programmes have been written for the BBC by educators in the U.K.

This material, which is of a singularly high standard, was prepared to achieve a major British Government policy objective of computer literacy in schools.

In addition, a number of State Education Departments in Australia have

written a range of curriculum specific software to plug any cultural gaps.

To simplify the learning process (not to mention the teaching process) the BBC system allows each student in the class to progress at his or her own pace.

Unlike the traditional classroom, no one is held back by the other students or, conversely, left behind.

Even the language of the computer, BBC Basic, is easier to operate so students can begin computer programming much earlier.

In short, the BBC is the computer for learning.

And once again, the British Broadcasting Corporation has helped make the learning process a pleasure.

The BBC school computer.

For more information on the BBC microcomputer and the new compact version, the Electron, send this coupon to: Barson Computers Pty. Ltd. 335 Johnston St., Abbotsford, Victoria 3067, or 7 West St., North Sydney 2060. Or phone Barson Melbourne on (03) 419 3033 or Sydney (02) 957 2588.

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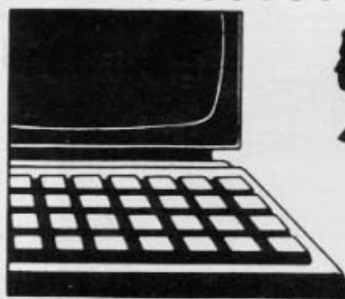
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BARSON COMPUTERS

Draw McDonald & Kelly RAB 351



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Doubtful pleasure

These days everyone is obsessed with the cult of calling everything by its initials, and in your November issue you refer, in three places, to Artificial Intelligence as 'AI'. On page 80, Michael Stevens tells us that AI is concerned with choosing which particular event 'has more value (or gives greater pleasure?) than others'. Beware!

For decades the farming community has used the initials AI for Artificial Insemination. It needs no computer to tell you that this brings very little pleasure to the bulls (who prefer the old-fashioned methods), and none whatsoever to the cows. The community itself will derive little pleasure in seeing its abbreviation hijacked by the upstart electronics industry. That industry bellyaches enough about 'program piracy', but does not itself seem to be above abbreviation piracy.

There could well be misunderstanding were an enthusiastic computer salesman to assure a farmer that within a few years the whole of his administration will be handled by AI!

J English

GOTO a deep discussion

APC articles are invariably informative and thought-provoking, but David Bradnack's presentation in 'GOTO, Thou Sluggard' (September APC) was excellent. If articles were rated as to the pleasure they gave the reader simply through style

and wit, this masterpiece would rate 100 per cent every time.

I still haven't read it in its entirety (I'm going to cheat and load it into my micro as a series of PRINT statements with appropriate GOSUBs) and Mr Bradnack even caught me on the hop with statement 180.

I have to confess to being a proponent of the modular approach to programming, and I do write many routines in the manner which has been so cuttingly presented. Yes, Mr Bradnack, you *have* made your point, and very cleverly too.

I take issue with the association between GOSUB and structured programming; along with the BBC Micro, my much-maligned TI-99/4A is capable of producing programs using the procedural approach. The procedures are called 'sub-programs' and are, I believe, slightly more powerful than the BBC PROC. Without going into deep discussion of either the merits of the TI-99/4A (there are very few) or of the structure of sub-programs, there's one highly important difference between a subroutine and a procedure.

Whether your programs are peppered with GOTOs or laced with GOSUBs, if an error is encountered, the computer will (usually) stop and issue a report of some description together with the statement number at which the error became evident. Your task is then to decipher the route taken by the interpreter from the start to the point in question. After even a few minutes processing, this can be an impossible task.

While I can't speak for the PROC function, the use of

sub-programs on the TI-99/4A provides an 'audit trail' which is presented to you automatically whenever it encounters an error. The kind of horrendous error generated while nesting sub-routines causes no problem with nested sub-programs, as all steps are detailed for you. The typical TI screen presentation might be:

```
*BAD VALUE IN 4010
IN HEXDUMP
  CALLED FROM ASSIGN
  CALLED FROM SPLIT
  CALLED FROM GETCHAR
  CALLED FROM SCRCHK
  CALLED FROM INTRO
```

From this you know exactly the route that the interpreter took and can follow at a leisurely pace with pencil and paper. The use of GOSUB does mean that any route can be followed provided that you can: (a) retrieve all the unresolved RETURN addresses from the GOSUB stack and relate them to your program; and (b) be sure that no overflow of the stack occurs, losing some of the unresolved RETURNS. GOTO gives you none of this information.

While I do not accept the near-hysterical outbursts from some academics with respect to GOTO, Basic and brain damage, I am equally cautious about accepting Mr Bradnack's contention that selective use of GOTO in place of GOSUB is a preferable approach.

Finally, whatever your views on GOSUB, GOTO, Life, The Universe, and Everything, you have to admit that Mr Bradnack would have an excellent future as a politician!

P Brooks

Unknown errors

As the owner of a Commodore 64 I have a few enquiries about a recent error I discovered while working with disk files. The following program demonstrates what I mean:

```
10 B$=CHR$(34)+CHR$(34):A$=B$+"DATA"+B$
20 OPEN 1,8,15:OPEN 2,8,1,"DATA FILE"
30 PRINT#2,A$
40 CLOSE 2
50 OPEN 2,8,2,"DATA FILE":INPUT#2,C$
60 PRINT C$:CLOSE 1:CLOSE 2
```

Obviously the interpreter will be confused by the double quotes at both ends of the string, but when you RUN this program, the computer generates a ?FILE DATA ERROR IN 50. A quick look in the reference guide reveals that this error does not exist, and it is not listed in either the 64 user manual, reference guide, drive manual or any of the other numerous books and magazines I have on the 64. Why is this error not listed? What in fact does it mean? Is the computer generating errors even Commodore is unaware of? Any suggestions will be much appreciated.

A great magazine, but how about some more room for adventures? A page on Zork tips, or how about some reviews of Level Nine adventures?

R Howlett

(Hope the following at least partially satisfies your hunger for Zork tips.

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P.S. If you have written any Programs and you think they might be useful to others. Please send them to us so we all can share them.

Anyone with a solution to R Howlett's problems should address it to 'Communications' — Ed

Zork clues

With reference to 'Zork obsession' in the November issue of *APC*:

What a relief it is for someone to know how to win Zork.

First of all: there is a chest on the cliff edge. Take it, and wait for a man to come down. He will ask you to tie the chest to the rope. Do it. Wait a while longer, and he will ask you to grab the rope, which you should do. He will have now opened the chest and taken the jewels out. Don't try to take them from him. He will give you a staff. If you try to get the jewels, the staff will break. Keep the staff, you will need it later.

Secondly: in Zork II, to get past Cerberus, you must put the collar from the kennel on the dog to go east.

Thirdly: in Zork I, to move the coffin you must either get the sceptre which is inside the coffin and wave it, then put it in the boat and go to the Altar.

Lastly: in Starcross, put the gold rod in the slot and the clear rod in the slot. Five slots will appear. Put the coloured rods in their coloured slots. Push the large pink square to set the course towards the inner solar system. Push the brown spot to choose your destination. To get to earth, press the brown spot four times. The violet spot chooses how you want to come in. Push the violet spot three or four times. The green button chooses speed. Push green twice. Push blue to launch. You have now won Starcross. (That's sneaky of me to spoil it all!)
D Chu

Hi-tech trepidation

As now a regular reader of

your magazine I thought I would give you a piece of information that you could pass on to your international travelling users of lap computers.

Our subject destination is Jakarta, Indonesia and our subject matter is Temporary Importation of your Travellers Best Friend — your lap computer which you are using for word processing, (keeping trip report notes), and a spreadsheet, (for keeping trip expenses up to date).

Of the many countries I have visited Jakarta is the only one exception to the rule of importation of a personal computer. I arrived in Jakarta for a three day business trip to horrifyingly learn from the customs man, who searched my bag in a most meticulous manner to ensure that I was not importing any other gremlins, that radios and computers are prohibited imports even on a temporary basis and that I would have to leave the computer at the airport in the care of the customs and with the hope that I may pick it up on my departure, the computer intact and still in working order.

For those who have visited Indonesia this is considered to be a distant possibility.

So, after a full day of arguing with customs officers I was granted a temporary import status and provided that I presented the computer and myself at the airport an hour before the scheduled check-in time, these items could be re-examined to ensure I had left nothing behind.

For the purpose of reference I have a Sharp PC5000 and, for travelling with the Sharp, a rechargeable battery, my second recharger, a Superwriter bubble, a Supercalc bubble and two database bubbles.

All this packs into a very well designed briefcase that stays on board the aircraft with me like my only friend in flight.

R Mill



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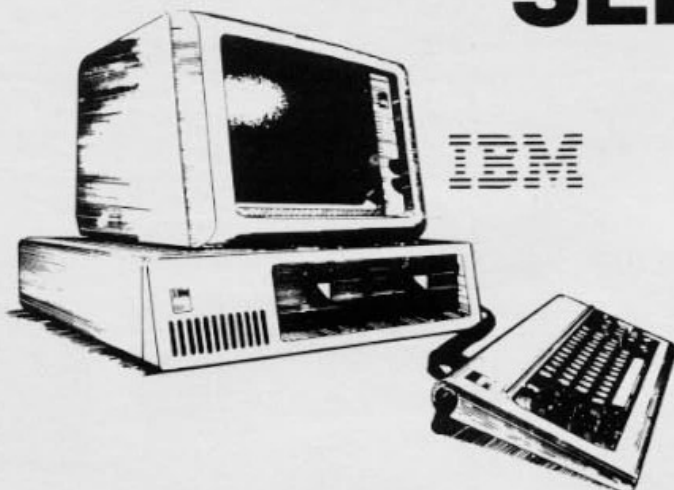
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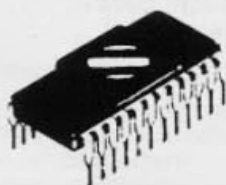
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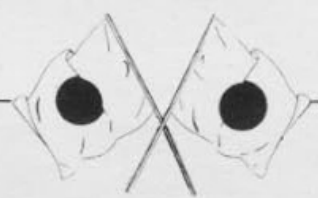


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Our Tokyo correspondent, Shinichiro Kakizawa, reports on what the best-dressed computer user is wearing this year and advises on matching accessories.

War of the standards

Sony's 3½in micro diskette is gaining acceptance as the *de facto* standard for the micro-size floppy disk. There has been a lot of confusion and competition on whose floppy would emerge victorious: among the competition were Sony's 3½in, the Hitachi and Matsushita group's 3in and Dysan's 3¼in. The reason for the standard is that the world's largest disk drive manufacturer, Y-E Data Company of Tokyo, has recently announced the result of its year-long evaluation on micro disks. The company's report concluded that the 3½in was the best for business applications, taking into consideration the manufacturing costs of the drives.

Y-E Data spent more than a year evaluating drive production technology, which included the drive performance and reliability aspects of both the 3in from the Hitachi/Matsushita group, and the 3½in from Sony.

With Y-E Data's announcement, the number of manufacturers adapting to the 3½in drive will probably increase dramatically.

The focus of Y-E Data's evaluation was placed on a drive's reliability in business use when mass produced at low cost. For business use, a disk drive must be compatible with 8in disks and have a storage capacity of 1.6Mbyte per disk. Y-E Data concluded that the mass production 1.6Mbyte 3in drive will be far more costly compared to the cost of producing a drive of the same capacity using 3½in technology.

Toshiba has received an OEM order of one million 3½in diskette drives from the US giant IBM. Toshiba was among the 20-plus contenders who fought for the big order. Toshiba has only recently joined the disk manufacturing business, and had originally been planning

to produce 3in drives. However, because of IBM's decision and Y-E Data's evaluation, it quickly switched its production line to the 3½in drive. The company's production capacity is presently 200,000 units per month. It would now appear that buying a 3in series diskette drive, other than the 3½in Sony version, would be risky.

Y-E Data has not yet revealed its findings on the disk size for home hobby computers.

Watch this space

Casio has started shipping data bank wrist-watch computers. The new watch, called the 'Casio data bank read sensor', can recognise the handwritten alphabet and numeric characters. Characters you write on the glass surface of the watch with your finger become the input data to the watch and are consequently stored in its memory.

The watch can store a maximum of one kbyte of data — the equivalent of 50 names and telephone numbers. Each entry consists of eight alphabet characters and 12 numeric digits. The watch features an eight-digit calculator function which also uses the same handwritten character recognition.

The product costs \$70, and is the result of Casio's integration of its two earlier products — the character recognition wrist-watch calculator and the data bank wrist-watch with touch-key input function.

Lighter printing

Liquid crystal printers claiming to be the next generation printers will be available soon. Epson and Casio have both announced their products for the spring. The liquid crystal (LC) printers print one full page at a time —

and have a similar capability to laser printers. However, the cost of an LC printer is much cheaper than a laser printer due to its simple printing mechanism. It can also produce a very high quality printing result at high speed.

The heart of the LC printer is the part called the 'liquid crystal shutter'. Light is unable to pass through the liquid crystal board when a certain amount of electric voltage is applied. As soon as the voltage is removed, however, the light can freely pass through. So, by inserting a number of micro-size liquid crystal boards between the light source and the light-sensitive drum, the LC shutter controls the printing function.

Unlike a dot-matrix printer which forms characters by arranging the dots, the LC printer can achieve a high quality and high density printing result, and reverse printing is a very simple process.

IBM moves to Japan

IBM Japan has announced a series of new 16-bit micros for the Japanese market. The machines are marketed as the lower end systems of the existing IBM 5550 16-bit business micro which has sold well in Japan for nearly two years. The new series consists of four models — JX1, JX2, JX3 and JX4 (the JX1 is the low end system and JX4 the highest). The series was designed by Fujisawa Lab of IBM Japan, and Matsushita will manufacture them — which is the same arrangement as its predecessor, the 5550, had.

All JXs use the Intel 8088 chip (the same as the IBM PC and XT) and run PC-DOS 2.1 (the JX version). This processor/OS combination makes the new machines program-compatible with the IBM PC. Data compatibility is also offered with a 5¼in diskette. With this data and

program compatibility, the vast choice of PC software has finally reached Japanese shores.

Going into overdrive

Hitachi has developed a desktop mass floppy disk drive which has a capacity of five gigabytes per spindle. The machine stores 500 tightly-packed 8in floppy disks in a small, sealed case and rotates all 500 together by a powerful motor.

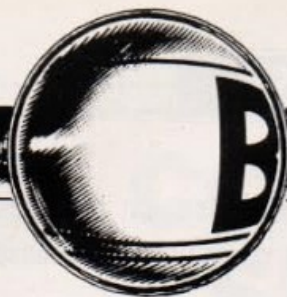
The most notable feature of the device is its low cost. While it offers a massive storage capacity comparable to higher end hard disk drives, the cost per bit of the new device is only one tenth of the hard disk because it uses low cost floppy disks. Each floppy disk is separated by a 'spacer' made of stainless steel.

The data transfer speed of the device is 0.7Mbytes. This is faster than an optical disk. An interesting development to watch.

Dressed not to kill

A special cloth to protect the human body from potentially harmful electromagnetic radiation has been announced from Takase Co of Osaka. Government health authorities in Japan have not yet reached any specific conclusion as to the risk of radiation on the human body, but Takase has quickly taken advantage of the average VDU user's fear.

The idea is that by wearing a cloth made of a special material called 'metax', you are protected and safe from the effect of the harmful electromagnetic fields commonly found in any computing hardware environment. Metax is made of polyester and coated with a thin nickel film. It is claimed to help reduce the electrostatic charge in the human body.



BENCHTEST

Data General One



BENCHTEST

Well-known minicomputer maker Data General has taken a courageous step in launching a portable micro in an already crowded market-place. But a machine which offers IBM compatibility and a 25-line LCD could attract the 'mobile' executive — and such is the company's aspiration.

Peter Bright gives it the once-over.

Enter the One, a new lapheld micro from Data General (DG) a firm better known for its minis. The new machine offers a 25-line LCD display, up to two built-in disk drives, IBM compatibility and up to 512k of RAM all running from rechargeable batteries in a lapheld package.

Hardware

From the side the DG One looks like a small toboggan: the bottom is flat but gradually slopes up towards the front. I'm sure that if anyone ever made any decent-sized replicas, you could get up quite a speed riding one on a good snow-lined mountain.

The machine is finished in two-tone light and dark brown. When closed up it measures just 35 x 30 x 7 cms, which is just about small enough to fit into the APC-standard briefcase. It was, however, a very tight fit and there wasn't even room for a couple of 3½in disks. According to the specification the whole unit weighs four kilograms — it felt much heavier when I was carrying it home and the scales in the office put it at five and a half kilograms.

When the unit is closed up it looks very secure. There are no holes or ventilation slots, and the only visible means of entry is the slot (or slots) for the internal disk drive(s). The only thing it lacks is a carrying handle; Epson got it right with the PX8 which has a nifty little handle built-in.

To start the machine you press in two catches on the front and hinge the lid up: this lifts to reveal the keyboard, LCD and the on/off rocker switch. One of its nice features is a hi-tech auto power off device built into the lid. When you close the lid, a lump of plastic hits the on/off switch and rocks it to the off position.

There are two other covers on the machine. One is on top just behind the lid and hides the battery compartment. The basic machine runs on Duracell-type batteries, but the review machine came with the optional extra rechargeable batteries.

The other cover is at the back and hinges down to form a foot which lifts up the rear of the machine. It also reveals the I/O and external power ports. This cover is the worst-designed piece of plastic I've seen in a long time — I've got the cuts on my fingers to prove it. It had a nasty habit of collapsing when I least expected it



The keyboard is very cramped: 79 keys are squeezed together tightly

(usually when I was plugging in a cable) and then not closing when I wanted it to.

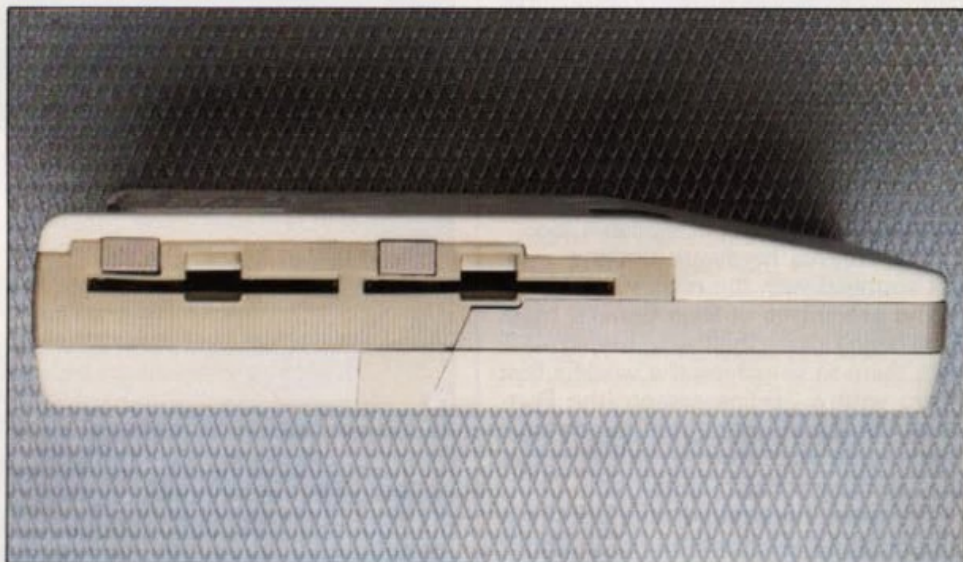
I/O is fairly limited on the DG One. Along the back panel from left to right we have: internal modem output, two RS232 ports (one printer, one external modem), the system expansion bus, and two power inputs.

It's odd that there should be two power inputs. One is for running the system and the other is for the battery charger, but I don't know why DG couldn't charge the batteries from the

system power input. The result is that the machine is supplied with two separate power transformers — one for the batteries, one for the system.

Getting inside the machine is difficult. I tried but gave up admitting defeat, which isn't surprising as CMOS chips are notoriously sensitive and DG doesn't want people poking around inside the unit.

There are no ventilation slots in the casing — they aren't necessary. Most of the DG One's electronics are CMOS which not only means that it uses much



Verdict: good for tobogganing but, more importantly, two built-in 3½in disk drives

less power than normal machines, but also that it runs much cooler. The casing didn't even get warm on the test machine.

The main processor in the DG One is an 80C88, the CMOS version of the popular Intel 8088 processor used in the IBM. One of the DG One's major advantages is that it's compatible to a large extent with the IBM PC, thus giving it access to a large range of hardware and software.

The basic DG One is supplied with 128k of RAM; the review machine was the fully expanded 512k model. The chips used are CMOS 64k static RAM chips. Interestingly, although the RAM is CMOS, it isn't battery-backed. This means that when you switch off the machine, you lose all the data in the RAM. According to DG, battery-backing a 512k machine would write off your batteries too quickly.

The basic model comes with one built-in Sony 3½in disk drive as standard: this is a double-sided unit giving a total formatted capacity of 720k. As the review machine was the expanded model, it had two 3½in drives built-in. In addition to being small these drives also use less power than 5¼in drives, so it's feasible to run a machine with disk drives from batteries.

The manual states that the batteries will last for about eight hours with average disk access, but obviously the more you use the disks, the shorter the batteries will last. When the battery level is getting low, a message appears in the bottom left hand corner of the display to warn you, but the machine doesn't lock up, so you can close down in an orderly manner.

The DG One has an interesting range of optional extras. In order to be hardware as well as software compatible with the IBM PC, an external 5¼in IBM compatible disk drive can be plugged into the expansion bus. Another external module is available which holds a 5¼in drive and also houses IBM compatible expansion slots, which means that IBM cards can be used with the DG One. A small thermal printer is available too.

The external hardware options were not supplied with the review machine.

The executives at Data General must have been kicking themselves when ACT beat them to launching the world's first micro with a 25-line screen (the Portable). The Data General staff can console themselves with the knowledge that they've done a much better job.

The great thing about the DG One's display is that whereas the ACT Portable uses a wide, short screen to display its 80 characters by 25 lines, the screen on the DG One is almost square and is the

same size as a 12in monitor screen. This not only means that there's more height to play with, but also has the psychological advantage of looking more like a conventional micro display.

The official specification of the LCD display is: 80 characters by 25 lines in character mode, or 640 x 256 pixels in bit-mapped graphics mode. This can be downgraded to 640 x 200 pixels in IBM compatibility mode.

Large LCDs take a lot of decoding to work, and the DG One uses two custom-designed CMOS gate array chips to handle the display. In addition to normal display functions, Data General designers have designed comprehensive IBM display emulation into the gate arrays, so that the display on the DG One can emulate both the IBM monochrome and the colour graphics adaptor under software control. If an application package is designed to display colour graphics, then it will be grey-scaled on the DG One.

In use, the LCD display on the DG One is better than those on most other machines I've seen, but still bad in absolute terms when compared with a CRT. One of the problems is that although the display hinges up, you can only use it at one angle. You can't vary the angle as on machines like the Hewlett Packard HP110. You can, however, adjust the contrast of the display by using the CMD key and the up or down arrow keys. This helps to some extent, but you still need to position the machine carefully to get good results. Not surprisingly, I found that the display was at its best in natural light and at its worst

when sitting on my desk at home lit by a single 100 watt lamp.

The characters are nicely formed and looked very like the characters found on a VDU, but the 'shadow' characters on the HP110 are superior.

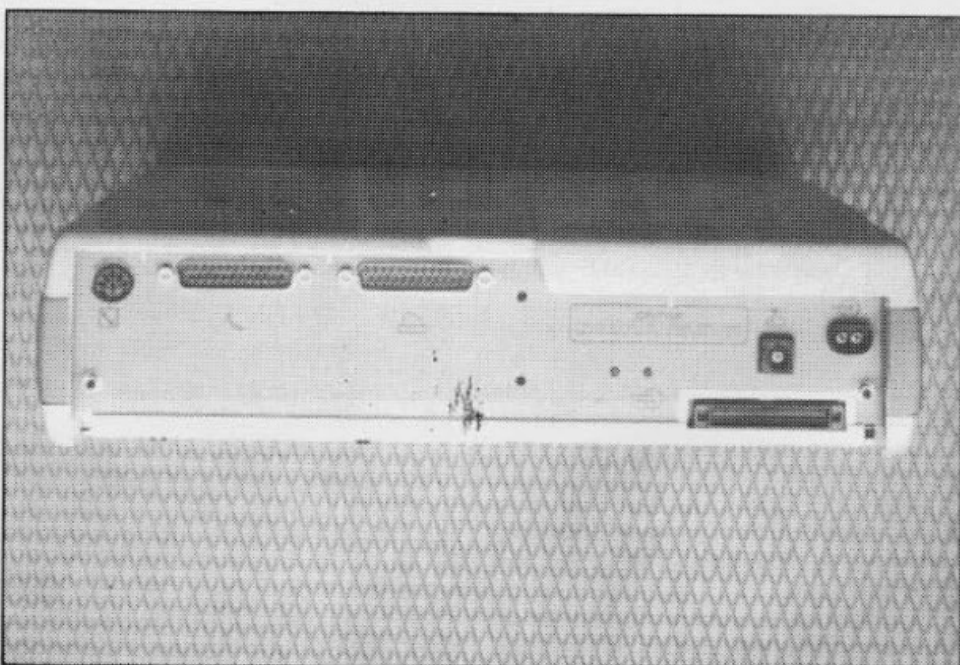
When the unit is closed, the keyboard is hidden underneath the display. As soon as you open the unit to use it, the display hinges up to reveal the keyboard. As on most portable machines, the keyboard on the DG One is cramped. It contains a total of 79 keys, all squeezed together tightly.

The first thing you notice about the keyboard is that for a machine purporting to be IBM compatible, it's very un-PC like. I suppose this is unavoidable in a portable, but it plays havoc with the pretty keyboard overlays for programs like Framework.

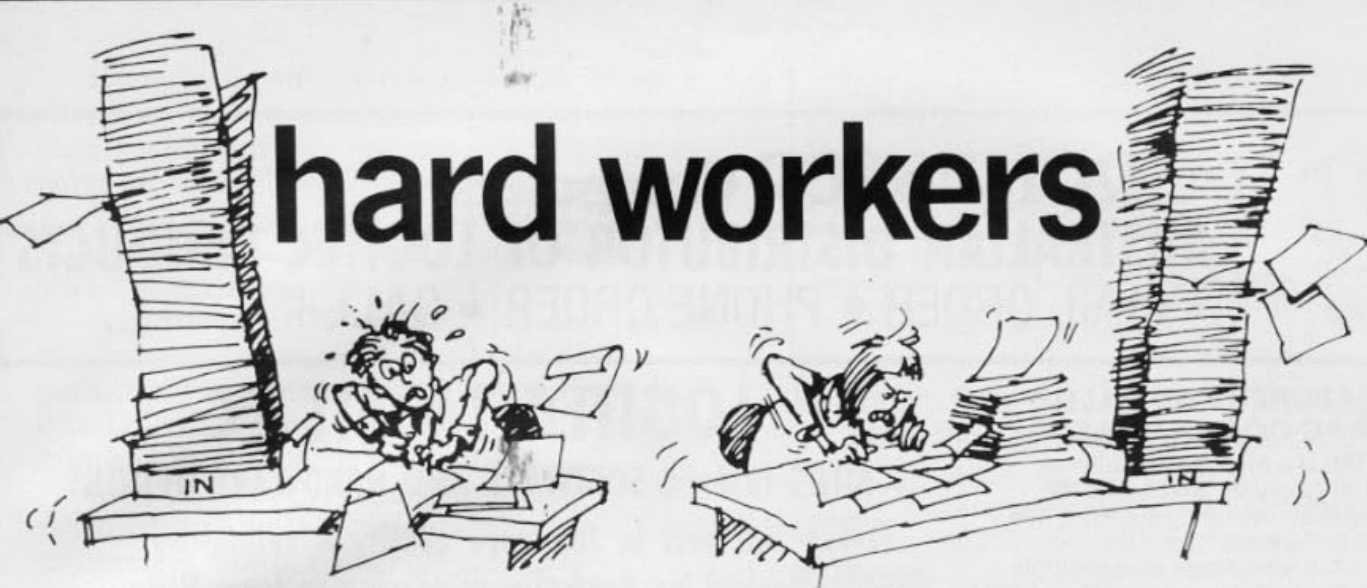
The overall look is very old fashioned, but I'm not sure whether it's because of the cream and brown colour scheme or because the keys look like they're built on two levels. Everyone who saw it commented that it reminded them of old mainframe terminal keyboards.

The layout of the keys is fairly standard. The main qwerty section is set in the middle and coloured a darker brown to distinguish it from the editing keys. The 10 function keys are set out in a row along the top of the keyboard. Above the function keys is a space for a function key strip which can be used with applications custom designed for the DG One.

The cursor control keys are set out in a line to the right of the space bar. This at least is an improvement over the IBM PC where they're incorporated into the



Internal modem output, two RS232s, the system expansion bus and two power inputs



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How many times have you typed a massive document only to find it has spelling errors? Then there's the dreaded 'teh', and 'adn'. Messy.

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Wordcraft's full function calculator will process figures within your document any way you like. Or you can use it independently.

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Say Hello to Wordcraft

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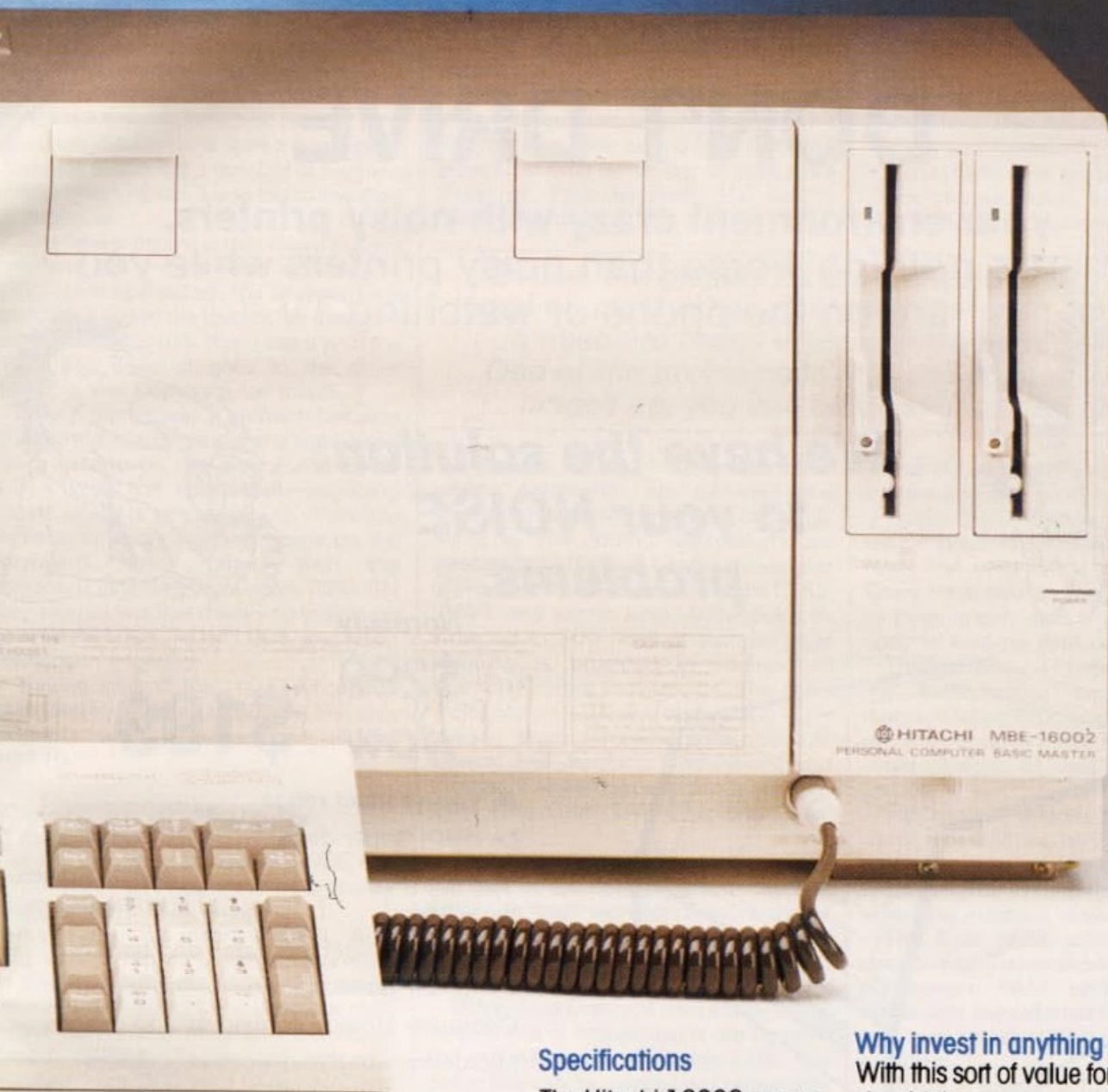
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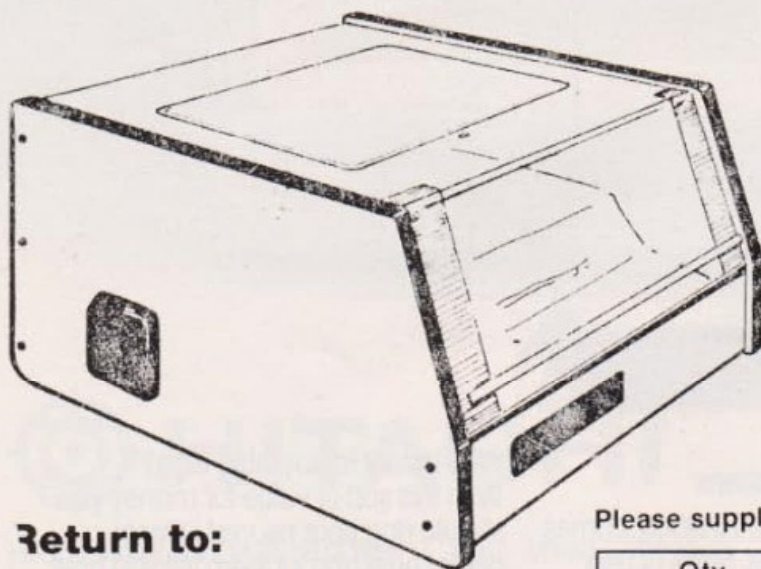
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numeric pad. The DG One doesn't have a numeric key pad as such, but the functions are built into the right-hand portion of the typing area. This can be a problem if you don't realise that you have NUM LOCK engaged and get '5's instead of '1's.

The DG One has more than its fair share of control keys. In addition to the normal CTRL, ALT and ESCAPE keys, it has SPCL and CMD. SPCL doesn't do anything useful. To the right of the RETURN key is a blank key, which doesn't do anything useful either.

In use, this keyboard is an odd mixture. The keys are unusually well pitched for a portable machine and have a good, positive feel. It also has a number of niggling faults which makes it less fun to use than it might be.

The first problem is that if you put the machine flat on the table without the back cover opened up, the keyboard is a good inch above the level of the desk and is impossible to use. If you use it with the back flap down it goes to the other extreme and slopes up too much.

Touch typing was a problem because the right three fingers of my right hand were resting on the cursor and CAPS LOCK keys and accidentally engaging them, which is what happens when you have to fill every available space on the keyboard. Other gripes with the keyboard include a minuscule RETURN key and the fact that there's no indication that CAPS LOCK, NUM LOCK, and so on have been engaged.

Having said all that, the keyboard is still good by portable standards. The only portable with a better one is the HP110.

System software

The DG One will run both MS-DOS and CP/M-86; the review machine was supplied with MS-DOS version 2.11.

If you reset the machine (CTRL, ALT, DEL as on the IBM PC) without any disks in the drives, the machine will spend a moment searching for a bootable disk, admit defeat and drop into the ROM-based utilities. These can also be reached from DOS with CTRL, ALT and CMD, but the machine is reset so you'll have to reload DOS afterwards.

Four functions are provided from ROM — Notebook, Terminal, Set Up and Diagnostic — and are entered by hitting the appropriate function key (F1 to F4).

Notebook is designed as a basic text entry system for preparing one-off memos, and so on. As such, it's just about (but only just) acceptable. If you're going to do anything more than the most basic text editing, you'd be better off with

a proprietary word processing package.

The Notebook screen is divided into two sections: the top 22 lines are set aside as the typing area, and the bottom three lines are used as command/message lines. What is immediately noticeable when typing is that when you get to the end of a line, the machine beeps and doesn't proceed to the next line. It expects you to insert a carriage return at the end of every line just like a low-tech typewriter! What's the point of a word processor without a word-wrap?

Things gets worse when you find that although your text is stored in RAM, it's destroyed as soon as you boot DOS and there's no way of saving to disk from Notebook. Even the Tandy 100 can do better than that.

'In use, the display on the DG One is better than those on most other machines I've seen, but still bad in absolute terms when compared with a CRT. One of the problems is that although the display hinges up, you can only use it at one angle.'

I suppose we should be grateful that editing commands are provided and you're not expected to re-type mistakes. As it is, the editing instructions are strange but effective. Cursor movement is provided by combinations of the CTRL, SHIFT and arrow keys. Notebook can store up to 500 lines of text, so page scrolling is provided in addition to character cursor movements. The command line provides five text editing commands plus commands for Search, Search and Replace, Tabulation, and Printing. The editing commands are Split Line, Join Line, Save Line, and Erase All.

Split Line allows you to move part of the text in the current line to the line below. In most word processors this is done by hitting <CR>, but here it's a separate command. Join Line is the reverse of Split Line.

Using Save Line, you save a copy of the current line of text so that it can be printed out when you hit Insert Line. The same line can be printed out repeatedly until a different line is saved.

The second ROM-based routine is a dumb terminal emulator. It offers a choice of two emulations: either Lear Siegler ADM 3A or DG's own Dasher D2. Assuming your firm doesn't have a DG machine, the ADM 3 option will get you onto most systems.

The command line allows you to select either the internal modem (of which more later), or an external modem connected to the RS232 line. XON/XOFF is provided although DG calls it OFC (Out-

put Flow Control). Baud rate, parity, and so on are controlled from the system configuration menu.

As with Notebook, you can't upload or download disk files using the ROM terminal emulator. However, you can run input to Notebook, edit it and send it back down the line.

The third ROM routine allows you to customise the system to your own requirements. You'd probably only use this routine when you first purchased the machine, or when you added to the system.

The Set Up menu has six options: Date/Time, Diskettes, Modem, Printer, Screen and Keyboard.

Date/Time sets the internal real time clock calendar chip, and is only used when the clock batteries are changed.

These are separate from the rest of the system and last two-three years.

Using the Diskettes option, you can tell the system how many disk drives you have; the valid range is one to three. There were two on the review machine as three is only used if you're using the optional external IBM compatible drive.

The Modem and Printer options set up the transmission settings for the machine's two RS232 ports. Both ports can work at up to 9600 baud with all the usual choices of data bits, stop bits and parity.

The last two options allow you to set the type of IBM display that the system is emulating and to set up the national keyboard. The system options are saved when the machine is switched off.

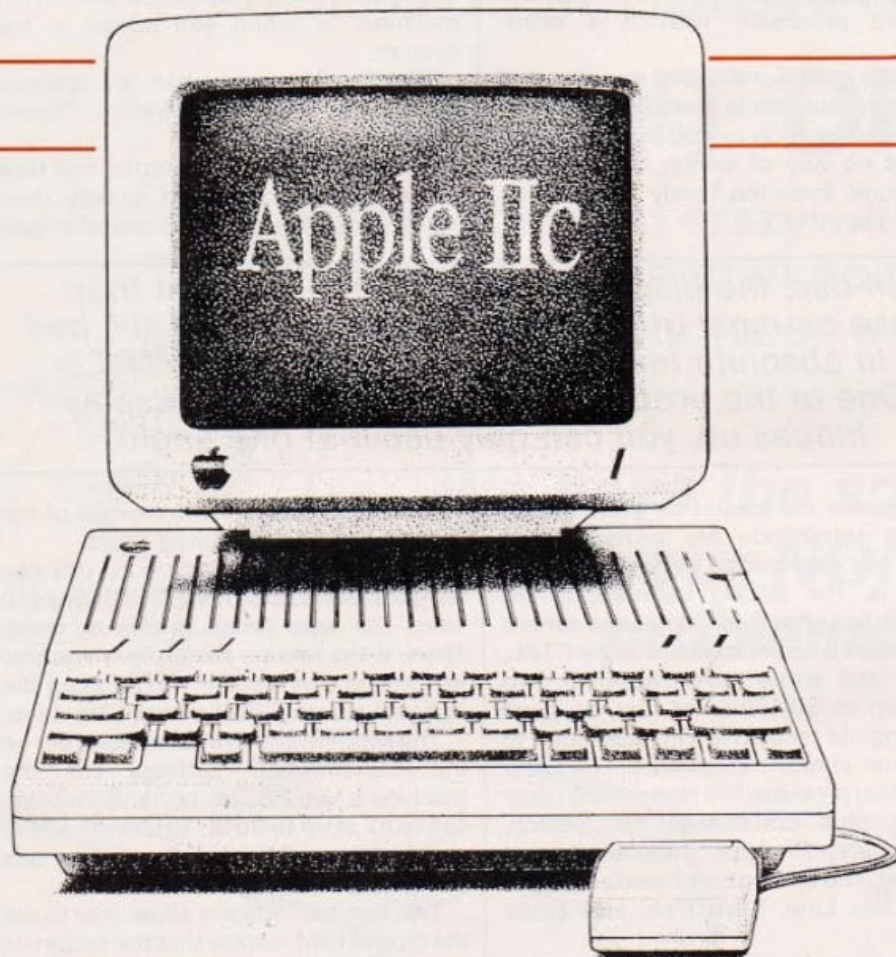
The final ROM utility is a set of diagnostics. These allow you to test out the system RAM, both internal disk drives and the external 5¼in drive if fitted, and all are destructive so I didn't run them.

MS-DOS version 2.11 is shipped with all DG One systems. When the system boots up, DOS takes the time and date from the internal clock so you simply accept the defaults when asked for date and time. The implementation of DOS is perfectly standard and is to be expected on a machine which is trying hard to look like an IBM PC.

The only minor addition to DOS on the DG One is an extended version of the MODE command. Using MODE you can change the values of the RS232 lines, change the print mode of the optional

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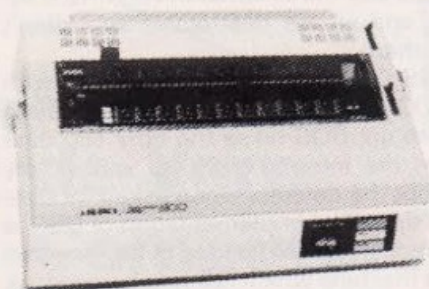
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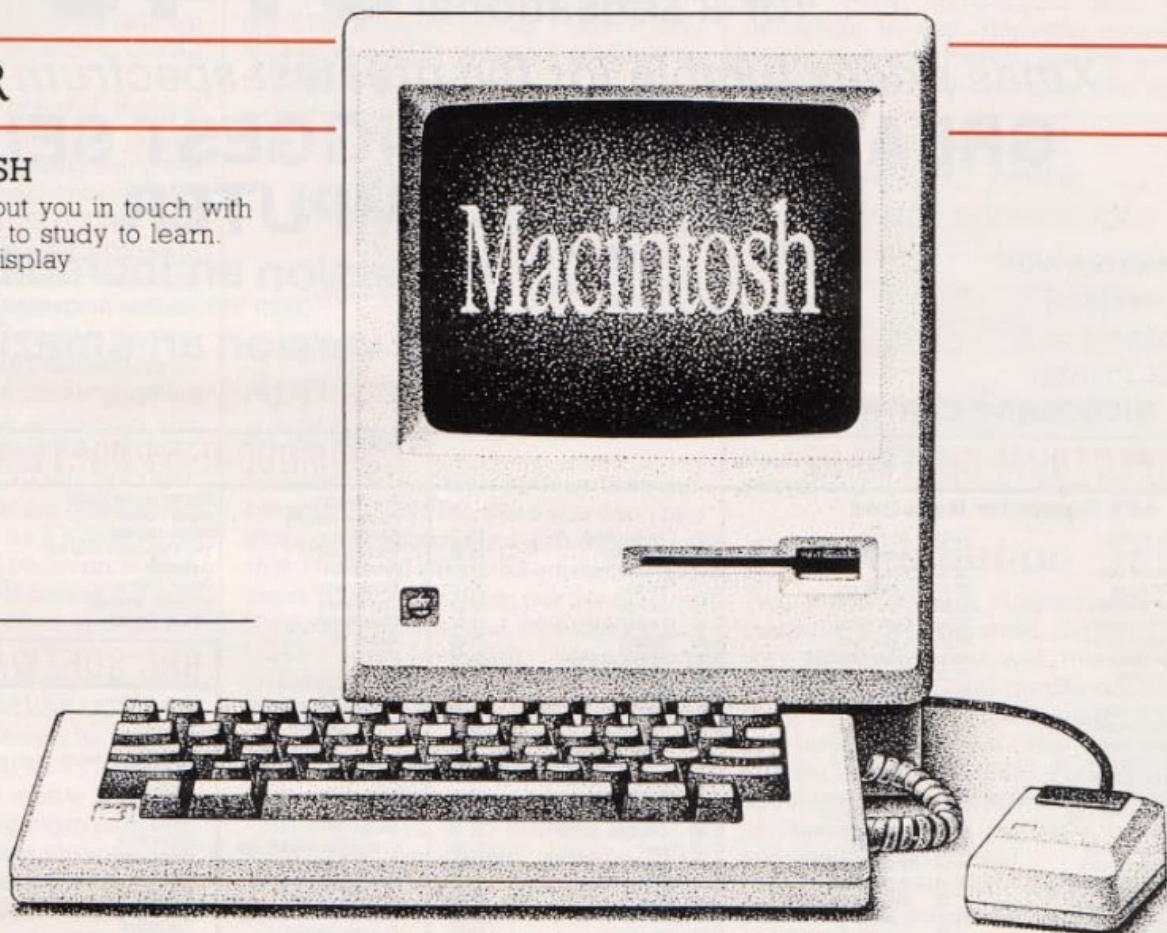
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DG printer, and change the mode of the IBM display emulator. To change the speed or the protocols of the RS232 lines, you just type something like MODE COM1:1200,N,8,1. This changes the first RS232 port to 1200 baud, no parity, eight data bits, and one stop bit.

One area in which the DG One differs from the IBM PC in terms of hardware is that while the PC uses a parallel printer port, the DG One uses one of the RS232 ports. This might cause problems when IBM applications look for the parallel port and can't find it, but DG has put a patch in the BIOS redirecting all output to COM2 to avoid difficulty.

If you're using the optional thermal printer, you can change its print quality from draft to near-letter quality using the MODE command. For near-letter quality you type 'MODE LTP1:NLQ'. The final use of the MODE command is to change the IBM display emulation. Different IBM applications packages are written for different IBM video adaptors, but the DG One can emulate both the IBM monochrome adaptor and the colour graphics adaptor. To change the emulation you type MODE followed by either MONO, 40, 80, BW40, BW80, CO40 or CO80. All the values for mode are reset when you re-boot the system, so it's best to set the default to the most common screen mode and use a batch file calling the correct mode for non-standard application programs.

The DG One is shipped with two configuration files called VDISK.COM and ANSI.SYS. If the user wishes he can call these as entries in CONFIG.SYS to alter the mode of operation of the DG One. VDISK.COM is becoming more common as MS-DOS machines are shipped with more RAM. It allows users to set aside a portion of RAM as a RAMDisk, and on the DG One was accessed as drive C.

ANSI.SYS is a screen device driver

which configures the system to respond to ANSI control codes. In this mode, the screen and keyboard respond to the same escape codes as a DEC VT100 terminal.

The final utility allows it to be connected to DG's CEO (Comprehensive Electronic Office) office automation system. As well as allowing access to all the facilities of CEO, it can translate files produced by certain common micro applications such as WordStar and Multiplan and transmit them to and from the CEO system, but as I didn't have access to a CEO system I couldn't try this out.

'while the PC uses a parallel printer port, the DG One uses one of the RS232 ports. This might cause problems when IBM applications look for the parallel port and can't find it, but DG has put a patch in the BIOS redirecting all output to COM2 to avoid difficulty.'

Applications software

Because the DG One is software compatible with the IBM PC, there shouldn't be a shortage of applications software to run on it. There will always be one or two packages which don't work, but the majority of popular applications, including Lotus 1-2-3 and Multiplan, are already available.

The major problem is likely to be working out how to get the software onto the 3½in disks. DG is arranging to move IBM applications onto these drives.

An alternative is to buy the optional 5¼in IBM compatible external disk drive, which reads IBM disks so that programs can be copied across to the internal disks. The only problem here is going to be copy protected disks, which will

have to be done professionally.

The third option, if you already have an IBM PC, is to link the two machines together and download software to the RS232 line. DG's preferred communications system is DGBlast which, in theory, allows you to upload and download program and text files. In practice, while my Olivetti M24 would talk to the DG One, the DG One refused to say anything to the Olivetti.

In the old days communications programs were complicated and very unfriendly to use. Recently, however, much more user-friendly programs have been released which make life much

easier. My favourite at the moment is Perfect Link for the IBM PC. Unfortunately, DGBlast belongs to the old school and is not to be taken lightly.

Documentation

Two manuals were supplied with the machine — one was small, the other was very small. The first was the DG One owner's manual, and contained everything you need to know to enable you to set up the machine, use the ROM utilities, and run MS-DOS. Packaged in a spiral-bound typeset form with good use of illustrations, it's relatively low-level and easy to understand.

The second manual was a cut-down pocket quick reference version of the first, which I found quite useful.

Conclusion

I always said that I wouldn't buy a lapheld until it had a 25-line screen, disk drives

Technical specifications

Processor:	80C88
ROM:	32k
RAM:	128k up to 512k
Mass storage:	Up to two 3½in 720k internal disk drives plus one 5¼in IBM compatible external drive
Keyboard:	79-key full travel
Size:	35 x 30 x 7 cms
Weight:	Four to five and a half kilograms
I/O:	Two RS232 ports, system expansion bus
DOS:	MS-DOS version 2.11, CP/M-86
Bundled software:	ROM-based terminal emulator plus editor
Peripherals:	Optional printer and IBM expansion chassis/5¼in disk drive
Modem:	Optional internal modem
Power:	240-volt AC or battery
Battery:	Eight to ten hours continuous use

Benchmarks

BM1	1.6
BM2	5.4
BM3	12.9
BM4	12.3
BM5	13.8
BM6	25.2
BM7	39.5
BM8	39.1

All timings in seconds. For a full listing of the Benchmarks programs, see 'Direct Access'.

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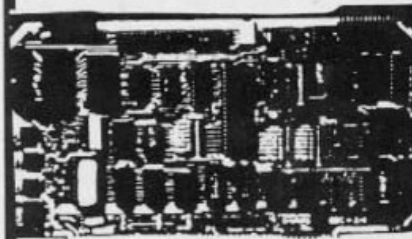
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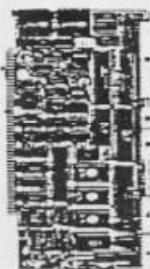
- * Z80A CPU
- * 2 or 4 Mhz switch selectable
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- * DMA compatibility allows MWRT signal generation on CPU
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- * Parallel port
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FDC-1 SBC

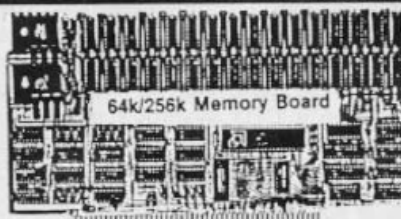
- * Z80A 4 Mhz or
- * Z80H 8Mhz
- * 2 Serial ports
- * 2 Parallel ports
- * NEC 765 Floppy disk controller
- * Up to 8k of Ram or Rom.

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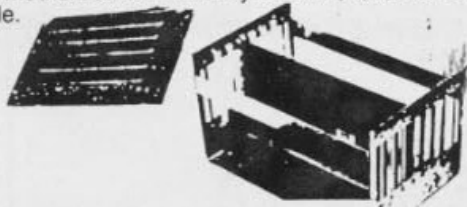


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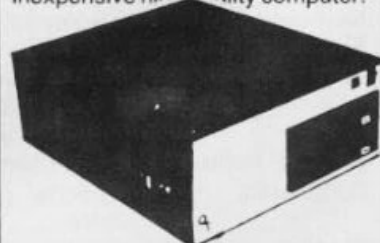
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BENCHTEST

and would work off batteries. I will now add another condition . . . 'and I can afford it'.

Low-power technology is still expensive. If it weren't, the pile-'em-high-and-sell-'em-cheap merchants would be using it.

For an expensive machine the DG One feels cheap. It's certainly nowhere near as well engineered as its major competitor, the HP110.

Apart from the price performance ratio, I have no qualms about the machine. It works well and the package of screen, disks and battery power is just

fine. Choosing between the DG One and the HP110 is a difficult decision; if Hewlett Packard built a machine to this specification I'd be ecstatic.

The marketing aim is to poach desktop business. People who use a desktop use the machine for more prolonged periods than people on the go with a lapheld. Given this assumption, I expect a desktop to have a good, easy to read display and a nice keyboard. The display and keyboard on the DG One are fine for occasional use, but I'd hate to spend seven hours a day looking at the LCD screen and using that keyboard.

For anyone who wants a go-anywhere machine that can run IBM PC software, and can afford it, this is a fine machine. I'll wait until CMOS becomes cheaper.

Prices

The basic system with 128k of RAM, one 720k diskette and AC adaptor will cost you \$5,200. The expanded version with 512k of RAM and two disk drives is \$8,800 (including sales tax).

In perspective

The marketing people at Data General are trying to be clever with this product. Its obvious market is as a go-anywhere, full-function portable which can be run off batteries and carried in a briefcase.

However, by offering the external IBM compatible disk drive and expansion units, the marketing men are hoping to poach some business from the desktop market. Although great things are forecast for the lapheld market, the real business at the moment is still with desktops. Data General hopes to sell very large numbers of this machine, and to do so they need to be in as many sectors of the market as possible.

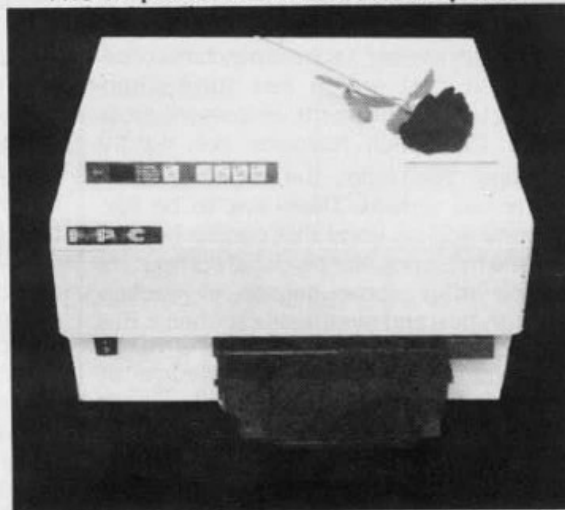
At the portable level, the DG One's main competition is from the Hewlett Packard HP110, which beats the DG One on engineering, user-friendliness and style. The DG One has a bigger screen and built-in disk drives.

Just as this issue was about to go to press, Data General informed us that the 'One' to go on sale in Australia later this month will be blessed with an LCD screen with improved intensity and contrast. So if Peter Bright's comments regarding the screen have dampened your enthusiasm for the machine, I suggest you call Data General when the One becomes available and arrange to see the new screen for yourself.

The first machines to go on sale in Australia will not have the internal modem as it has not yet been approved by Telecom. When it is, existing users will have the option of having one fitted. — Ed.

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Talking toys

If mastery of the qwerty keyboard is an insurmountable problem, give up and try a computer with speech recognition/synthesis capability. Martin Banks advocates speech, the oldest form of communication, as a viable and impressive alternative to hours of frustration and knotted fingers.

Once upon a long, dim, distant time there were two hairy sort of persons who stood facing each other, scowling. They stood like this for some time until one, enraged beyond containment, let forth a strange growling sound which scared the other so much that it ran off.

The essence of communication had been discovered, as had its value. From that point the human race has developed to the stage where it has produced a number of different ways of communicating to complement that first form, vocalisation. One of the most important of these has been the development of the written word and, from that, the development of the machines that help humans create the words more easily: stone tablets, pens, paper, pencils and the typewriter.

This last one brought with it one of those inventions that is, at one and the same time, both incredibly clever and a pain in the ... That invention is the keyboard. The qwerty keyboard is the bane of many people's lives, especially as it has been universally adopted as the standard form of input device for the computer. The technical reasons for doing this are quite sound and when the computer was a machine that was only used by trained personnel (either operators and programmers or typist-oriented key entry staff), the fact that the keyboard was being used didn't matter too much.

While the keyboard was being used exclusively by those explicitly trained in such arts, intimidation did not matter. Now it's different. Personal computers are everywhere. Workshop foremen use them, children use them, senior company executives use them. The intimidatory value of the keyboard has therefore become rather more significant.

A way around the keyboard was needed and over the last year or so

technology has come up with some answers. The mouse is probably the most famous so far and, as far as it goes, is an excellent tool for moving the cursor around and entering simple commands by pressing. (Sorry, but it still has keys.)

Another device that has been employed of late is the touch-sensitive screen. This is actually a misnomer, for the thing is light-sensitive not touch-sensitive but, despite such split hairs, it allows the user to point to locations on the screen with a finger or similar apparatus and identify tasks, functions, windows or whatever is required. Again this is fine as a means of imparting simple instructions to the computer quickly and in a form that the user can readily comprehend.

Now, however, technology has come up with that which has long been predicted — the form of communications for which humans are rightly famous. Yes, folks, the babbling computer has arrived. There are, to be fair, several add-on units that can be bought for the most popular personal computers which offer some degree of speech recognition and synthesis capability. But one of the first to come from a major manufacturer, to my knowledge at least, is the latest variant of the Texas Instruments Professional Computer.

TI has been in the speech technology business for some time, having produced such famous toys as the Speak'n'Spell educational unit. It also produced a speech synthesis add-on for its now defunct TI99/4A. These, it must be said, are just kids' stuff to what is now available. TI has produced a \$3000 add-on board for its hard disk variant of the machine which really does have some interesting possibilities, and which could become the next generation of executive status symbol.

Early versions of the speech syn-

thesis system tended to work only with small amounts of verbosity, and the digitised data for this was normally held in PROM on the same board as the speech processor. To limit the capacity further, the actual spoken sentences were constructed from individual words and phrases rather than long word strings. This meant that the recorded voice used in the first place had to be flat and uninteresting due to any intonation inevitably making a constructed sentence sound odd.

The TI system can now record a voice with any necessary intonation directly onto disk. It can then be read back for synthesis. On a 320k floppy, for example, TI claims it can record 20 minutes of continuous speech which can, as is the way with synthesis systems, be speeded up or slowed down without pitch changes as required. That may seem like a novelty but it has some uses.

The speech recognition system can identify some 50 different words in up to nine different vocabularies (that is, different individual voices). TI has produced a routine that allows the user to construct a file of commands which simulate the command keystrokes of any application program. Therefore it becomes possible to have the computer recognise you saying an application program command, 'scroll down' for example, and execute that command.

For a large number of applications this capability will allow quite a reasonable measure of 'hands-free' computing. With a spreadsheet, for example, it will be possible to have all the key commands and numeric data entry 'keystrokes' as spoken commands. Imagine it — the executive's status machine. You will sit at your desk and blithely say something like: 'Cell A4. 47321 point 68 return. Calculate.' The computer, with the right programming, will not only do the requested job but could also obsequiously mutter 'I hear and obey, oh Master.'

TI has introduced, at the same time as the speech system, a networking capability with all the usual bells and whistles including an electronic mail facility. It doesn't take too much thought to see that it should be possible to combine speech with electronic mail — after all, the digitised speech is just another disk file which can be squirted around the network.

Here is the ultimate executive's toy. Send someone a text document and append to it a speech file with myriad words of comfort, clarification, excuse, and so on. This could have some really interesting possibilities.

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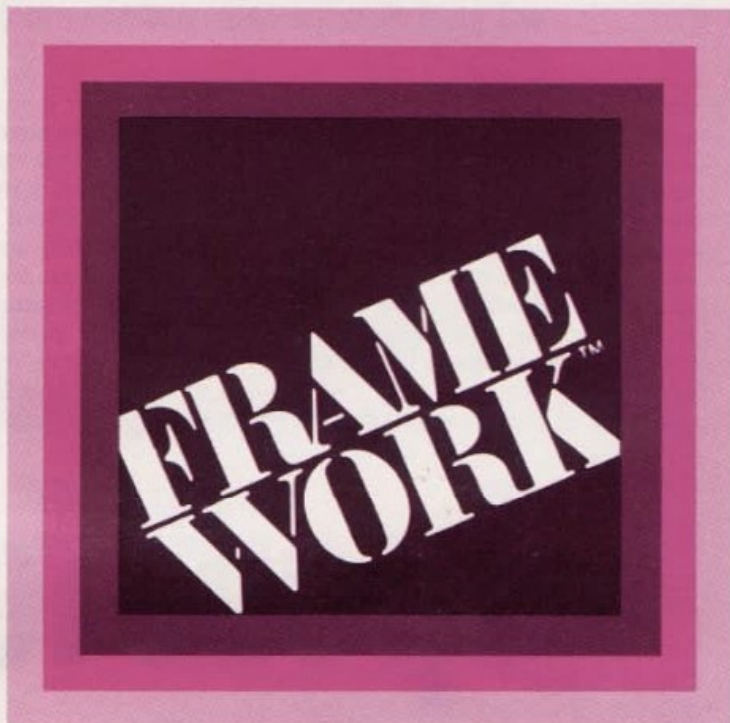
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Mike Liardet guides the prospective spreadsheet buyer through the bewildering choice of available systems, and gives hints on what, and how, to choose.

A couple of years ago spreadsheets were still something of a rarity. In those days there was VisiCalc — the world's first spreadsheet program, and a handful of early imitators. Whereas the would-be database or word processor user could look down a long list of products before making a selection, the budding spreadsheet user was invariably faced with Hobson's choice or, worse still, no choice at all.

A couple of years is a long time in the

fortunately (for them) they were unable to copyright or patent the spreadsheet concept, and in the intervening years a wide range of rival companies launched their own spreadsheet systems.

Today the spreadsheet is widely recognised as one of the software cornerstones for personal computing, along with word processing, database and graphics. Since many micro users need more than one of these fundamental packages, a number of manufacturers

Spoilt for choice

world of micros, and the situation is quite different today. Most of the major software suppliers, together with a host of newcomers, have plugged this gap in the market. All personal computer users, from the humble Commodore 64 to the world-beating IBM PC, can mull over the pros and cons of a wide range of spreadsheet software.

Paradoxically, this has made the situation more difficult since most prospective spreadsheet purchasers can easily become confused by the myriad claims and counter-claims of rival products.

History

Unlike most micro software, spreadsheets have no mainframe ancestry: they only became feasible with the advent of machines with cheap processor power and high-speed displays, otherwise known as micros.

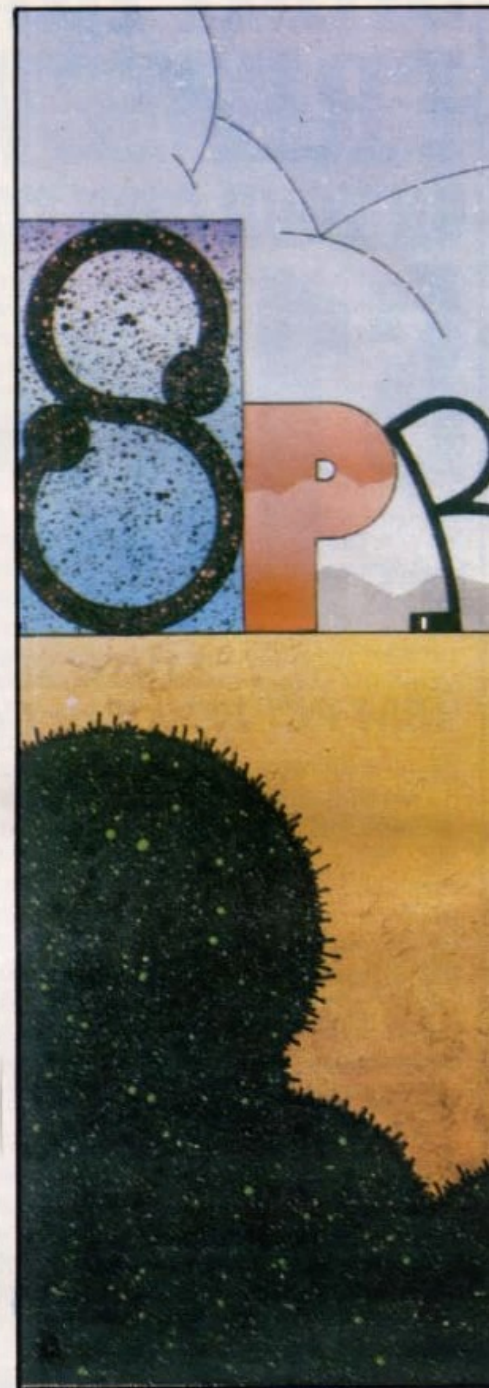
The spreadsheet appeared as recently as the late seventies by courtesy of two young Harvard Business School graduates, Dan Bricklin and Bob Frankston. Their program, called VisiCalc, was an instant success. Unfor-

have attempted to combine them in one 'integrated system'. The theory is that a single integrated package is cheaper and easier to learn, with benefits becoming apparent when data needs to be transferred from one type of application to another (for example, spreadsheet results to generate a graphics display).

Much of the more recent spreadsheet software does not exist as a stand-alone package, but is just one of five or six applications in an integrated system. It has yet to be demonstrated that the public really does want this type of mega-software, but the success of graphics-spreadsheet integration (in the form of Lotus 1-2-3) is undeniable.

What is a spreadsheet?

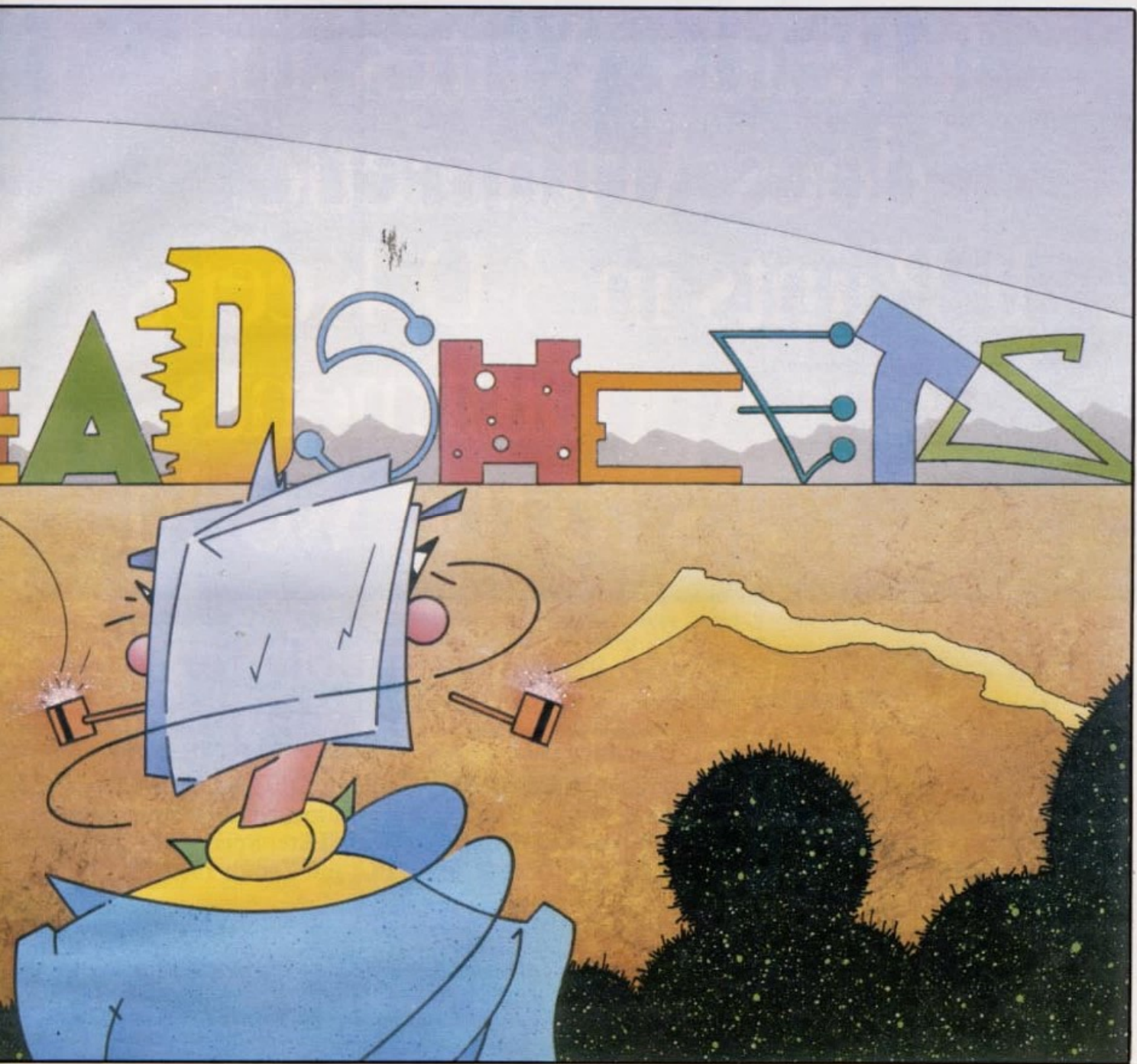
When a spreadsheet system is running, the VDU screen acts like a window on a large sheet of numbers interspersed with text headings, neatly laid out in rows and columns. As the sheet is much larger than the screen, only a part of it can be shown at any one time.



The spreadsheet rows are usually numbered and the columns identified by letters, so the coordinates of any cell can be ascertained; for example, the top left-hand cell is at A1, whereas Z99 will be further down and to the right.

A single cell is marked by the cursor, and is highlighted or distinguished in some way. By using a few keystrokes it's possible to shift the cursor to a new cell. Attempts to move the cursor off the edge of the screen cause a rapid redraw so that its destination can be displayed. If the redraw is fast enough, it's as though the window has been 'pulled' into a new position by the cursor.

At the cursor it's possible to enter text, a number or formula. A typical formula could be A1 — 10 * C2. If the values displayed at A1 and C2 are 76.5 and 6.7,



this will cause the cell containing that formula to display 9.5. In practice, formulae can be very complex calculations using a variety of maths functions and referring to many other positions on the sheet. The result of a formula's calculation is displayed immediately the formula is entered, but if a change is subsequently made at a position referred to by the formula (at A1 or C2 in the example), then a recalculation is made automatically so that the display remains consistent. This recalculation can have a knock-on effect to other formulae, which must also be recalculated, and so on. Frequently, an alteration on the top line of a spreadsheet can change everything from top to bottom.

Fast, automatic recalculation is the whole *raison d'être* of spreadsheets:

the equivalent exercise on paper might take several hours, even using a calculator. A spreadsheet saves time and produces error-free results (assuming the correct formulae have been used), which in turn encourages more experimentation with figures, or 'what-if' analysis, as it is termed.

The classic spreadsheet implementation is in financial planning, where 12 columns are used to represent the 12 months and the rows are used for profits, sales, overheads, and so on. But spreadsheets can also be useful as a laboratory tool, for statisticians, or in any area demanding repetitive calculator work. 'What-if' analysis can be especially useful in financial planning, where there's no certainty about the future, and a range of possibilities can be quickly

explored; for example, effect on profits if next year's sales are good, average or bad. Once a set of formulae have been built up in a spreadsheet, it's easy to experiment with a range of possible scenarios, as the recalculation effort can be performed quickly and accurately by the computer.

Requirements

To distinguish between a good and bad spreadsheet, you'll need a clear idea of your requirements. Most spreadsheet software will only run on a limited range of machines (IBM PC, CP/M systems, Apple II, and so on), so your choice will immediately be limited by the available hardware. You may insist on graphics or a link with other software, which will

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further limit the choice. There's also a major division between pure spreadsheet software and financial planning systems (based on older mainframe interactive techniques) which incorporate only some spreadsheet facilities.

When you have narrowed down the field, a demonstration of the more likely candidates is desirable to give you a chance to see the system's key features in action. Study the documentation and look for simplicity of style.

A popular approach is for documentation to be divided into tutorial and reference material. The tutorial sections should be readable and lightly entertaining; some of the later spreadsheet systems have tutorial material built into the software and you may prefer to learn this way. The reference material should provide the answers to fairly detailed questions that might arise once you are familiar with the basics. For example, whether the trig functions work with radians or degrees, or how to switch off automatic recalculation. The spreadsheet should be well-indexed for quick reference.

The most common problem encountered by spreadsheet users is lack of memory. A typical system might claim to handle a spreadsheet of, say, 256 rows by 64 columns, but run out of memory long before all 16,000 cells have been used. Spreadsheet size is limited by the amount of available RAM in the machine, thus 16-bit micros can accommodate larger spreadsheets than older 8-bit micros.

Once models become very large, the recalculation time, following a modification, becomes significant. To avoid irritating pauses after every modification, it's useful to be able to switch off the automatic recalculation facility: the

faster calculations can be performed, the better.

Apart from the basics (documentation, reliability, speed and size), most spreadsheet systems differ from one another with respect to the facilities they offer. Generally, users only require a few available facilities, and here are the major options:

Integrated software: if the system is, or can be, integrated with graphics software, it's a definite bonus.

Maths function: everyone needs plus, minus, times and divide, but some may need trig and logs, and other advanced maths functions. Statistics and special spreadsheet functions (like row-sum, or minimum value in a column) are also very useful.

Spreadsheet editing: most systems offer special facilities for inserting or deleting rows and columns, or editing formulae. It's particularly important that a good replication facility is provided. This will enable a model to be developed for just one column and quickly copied across several — which saves a considerable amount of typing.

Display facilities: there are a number of possible enhancements to a basic spreadsheet display — multiple windows, where the screen can window on two or more areas of the spreadsheet, variable column widths, and so on. It's possible to manage without these facilities, but they are useful in certain spreadsheeting methods.

Sorting: some applications need data to be sorted, and there are spreadsheet systems to provide this facility. For some applications (ranking students' exam results, for example), it's important that the sorting not only affects the column being sorted, but that data in other columns is moved simultaneously as a result.

Consolidation: if an organisation is split into several divisions, it's often necessary to sum key data into one global report — this is consolidation.

Goal seeking: you know which result you want — but how do you get it? Goal seeking enables you to reverse the normal logic flow in your model. For example, what sales (at the top of the model) will give a specified profit (at the bottom)?

Sensitivity analysis: say, you've formed a reasonably plausible plan, but how drastically will it change if some of your assumptions (for example, next year's inflation rate) are wrong? Sensitivity analysis shows how sensitive the plan is to variations from your initial guesses.

Programmability: if you're already a programmer, you might appreciate the ability to use the spreadsheet as a rather novel programming language. Unless you're a very sophisticated user, you're unlikely to want to stray into this territory.

Home computer systems

It's naive to expect a \$400 home computer to support serious business applications. Principally, home computers lack fast, reliable permanent storage facilities and have a reduced display capacity, which rules out any serious use of database, word processing or accounting systems.

But spreadsheet software does not make high demands on permanent storage facilities. Once the spreadsheet software and a saved model have been loaded, all further manipulation affects only the internal memory of the machine. As a home computer's internal memory

Product name	Tested on	Max Rows	Max Cols	Capacity # rows	Recalc rows/sec	Scroll rows/sec	Scroll cols/sec	Text # rows	Numbers # rows
Abacus*	Sinclair QL 128k	256	64	56	2.8	2.5	2.0	58	57
Falc	Sord M5	100	100			6.0	4.0	34	30
Framework	IBM PC 512k RAM				2.08	1.6	2.2		
Multiplan	Apple II 64k RAM	255	63	95	1.58	6.0	4.0	190	190
	Sirius 128k RAM	255	63	235	4.27	6.0	4.0		
PerfectCalc	56k CP/M 2MHz Z80	255	52		0.30				
PlanStar	IBM PC 256k RAM	5000	5000		0.16	2.0	1.3		
Symphony	IBM PC 458k RAM	8192	256	247	7.48	3.6	1.9	820	967
VisiCalc	Apple II 64k RAM	255	63	82	1.91	10.0	6.0	148	254
	+ 128k RAM	255	63	320	1.81	1.3	2.5	large	large
Vu-calc	Spectrum 48k RAM	60	60	240	1.00	4.0	3.0	240	240
1-2-3	IBM PC 320k RAM	2048	256	370	6.85	6.3	3.8	1210	1380

* Note that Abacus was tested on the Sinclair QL (at the time of its release) and has not been tested on the ComputerPhone as Telecom did not have a machine available as at the time of going to press.

Fig 1 Benchtest results

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Mitsui MC2100	120 cps/NLQ; 4000 hour MTBF reliability; Trac/Frix	\$ 599.00	\$ 350.00
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C. Itoh 1550 SP/SR	New 180 cps; 132 col Serial or Parallel	\$1395.00	\$ 995.00

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Amust GR-2	Extra HiRes (20 Mhz) Green by Taxan ; Latest Model	\$ 245.00	\$ 150.00
Amust AM-1	Extra HiRes Amber by Taxan ; Latest Model	\$ 260.00	\$ 160.00
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IN BUSINESS

and processor are identical to that of many business micros, spreadsheet performance should not be seriously downgraded on a home computer. Of course, loading and saving models to cassette tape does take longer, but this is only done occasionally during an average spreadsheet session.

Spreadsheet software for home computers includes Calc-Result for the Commodore 64, Falc for the Sord M5 (tested in the February '84 issue of APC), Vu-Calc for the Sinclair Spectrum and Abacus for Telecom's ComputerPhone. Abacus has been included in this home computer category as it was originally designed for the Sinclair QL, a top of the range home computer shortly to make its way to Australia (though not through official distributor channels).

Abacus is in a class of its own in this end of the market. It is included in the ComputerPhone's price along with three other packages (graphics, database and word processing). The four packages can exchange data between each other but must be run separately. It might be of interest to prospective ComputerPhone owners that Psion, the author of these packages, has also made them available for MS-DOS machines.

Integrated systems

Following the enormous success of Lotus 1-2-3, an integrated spreadsheet-graphics-database which deposed VisiCalc as the leading spreadsheet system, several integrated systems have been released in the last year.

It should be remembered that most integrated systems are not strictly spreadsheets at all, but provide a highly sophisticated and versatile software environment that can resemble a spreadsheet, a word processor or a database as the need arises (1-2-3 is an exception).

Lotus 1-2-3 was originally available solely for the IBM PC, but is slowly migrating onto other MS-DOS machines. The 1-2-3 environment is primarily a

spreadsheet, and the database facility is accommodated when rows of the spreadsheet are used to represent records with the columns being the fields. 1-2-3 has various sort and selection facilities to provide a crude but effective facility for handling small databases arranged in this manner. Its main selling points are its superb spreadsheet and graphics facilities, providing very fast calculations, plus pie charts and bar graphs.

Ashton-Tate, developers of dBase II, launched Framework as a rival to Lotus 1-2-3. Framework fully integrates spreadsheets, graphics, databases, word processing, ideas processing and communications. Each application type is held in a 'frame', of which there can be several of the same type. This means that several spreadsheet applications can be active at one time. If it's a spreadsheet frame it acts as a window on the spreadsheet in the normal way. All the frames can access each other's data, so data in a frame can be used to draw graphs in a graphics frame, or several spreadsheets can be totalled into a 'consolidation frame'. It's also possible to program Framework so that highly complex spreadsheet manipulations can be performed at the touch of a button.

Having produced 1-2-3, Lotus didn't rest on its laurels but set about improving it. The result was Symphony, an integrated system launched at the same time as Framework, but with a specification so similar that one suspects that both companies were working as hard at market intelligence as at developing the software.

Symphony's user interface is closer to Lotus 1-2-3 than to Framework. All Framework's applications are offered, but the underlying data is stored in one huge spreadsheet which is viewed through different windows (cf frames above).

Some of 1-2-3's best features have been transplanted into Symphony — the impressive calculating power and graphics, in particular. But a number of

Name of package	Producer	Issue of APC
Abacus	Psion	Not tested to-date
Falc	Sord	February 1984
Framework	Ashton-Tate	September 1984
Multiplan	Microsoft	May 1983
PerfectCalc	Perfect Software	November 1983
PlanStar	Micropro	August 1984
Symphony	Lotus	September 1984
Vu-calc	Psion	Not tested to-date
1-2-3	Lotus	December 1983

Fig 2 References

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Then they customized all their CP/M products to run perfectly on the PortaPak - products like dBASE II, SuperCalc, all the major languages, accounting

systems, etc. Most importantly, they stake their reputation that all these products will work without hitches. No other computer in Australia can offer this total software support.

As for electrical and mechanical reliability, look inside a PortaPak. There's a striking difference. The PortaPak is completely modular. We didn't scrimp by putting all the circuits on one board. We use *three*. Servicing is simpler, quicker and cheaper. It's why the leading national computer service company, TCG Pty Ltd, is pleased to offer a 12 month service contract on PortaPak in all capital cities.

Take an extra close look at the Canon disk drives. If Rolls-Royce built computers, they'd use Canon drives. See the massive head protection shield? Hear the way the heads lock away every time they deselect? The designers had an unusual attitude to reliability - fanatical.

Now carry out some speed tests. On a standard benchmark test using BASIC routines*, the timings are: PortaPak 12.9 seconds, IBM PC 16.4 seconds, NEC APC 19.7 seconds and Sirius 16.4 seconds. Using a standard dBASE II routine**, the timings are: PortaPak 8 minutes 11 seconds, IBM PC 11m 52s, Sirius 17m 9s and NEC APC 19m 16s.

The expensive imports really cringe at this because they make so much of being "16-bit" machines. PortaPak is an 8-bit machine and proud of it. Not only is an 8-bit machine inherently better suited to jobs like word processing, accounting, spreadsheets, etc, but the 6MHz clock rate ensures it can run rings around the others even in complicated mathematical tasks.

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*See Australian Personal Computer, Feb., 1984.

**See Australian Micro Computerworld, Nov., 1983.



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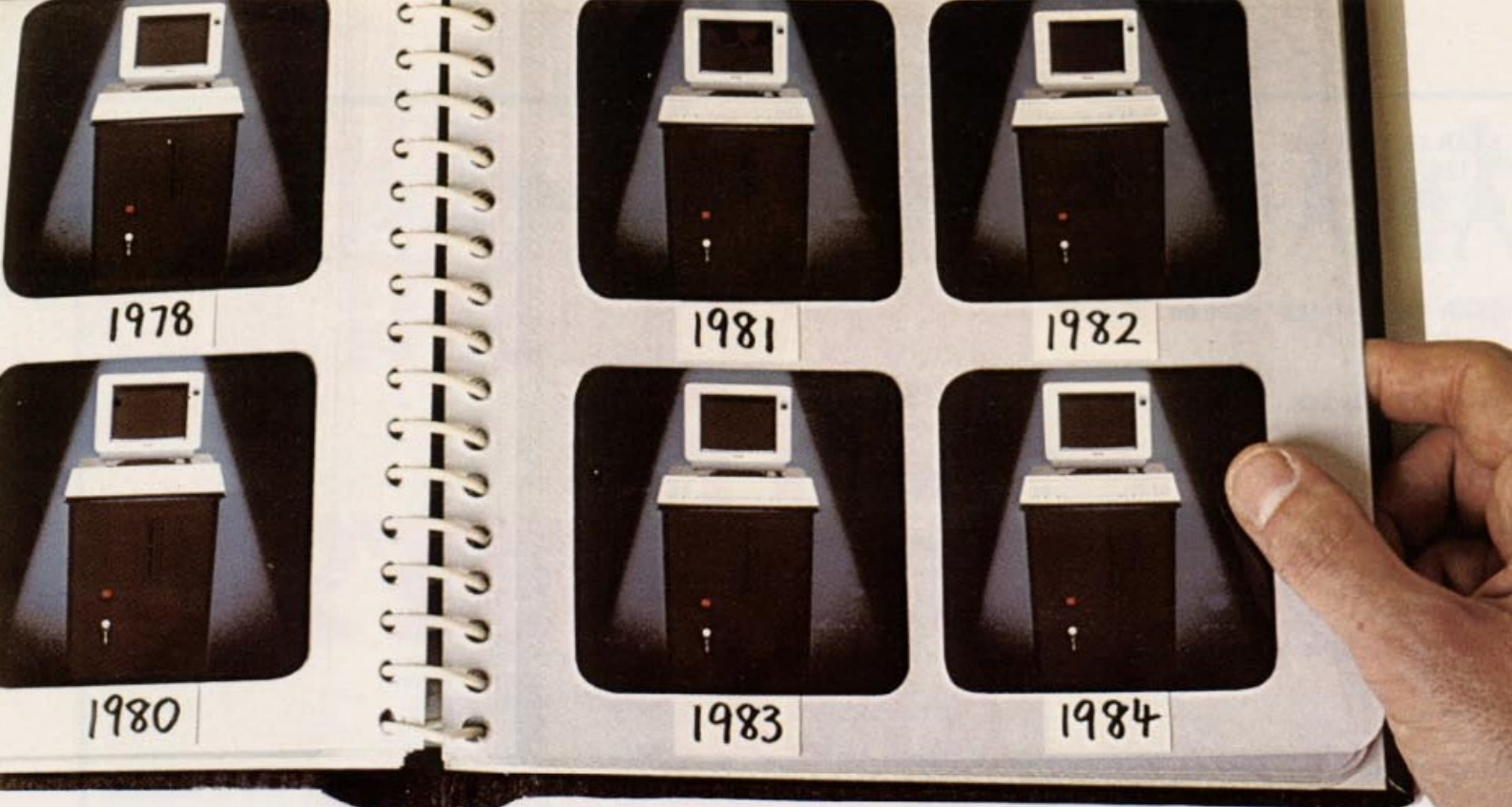
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UNIVERSE SUPERCOMPUTER

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new features have been added: an increased spreadsheet size, special word processing and communications facilities, and improved database facilities. Like Framework, Symphony offers multiple windows simultaneously onscreen, so more than one application can be viewed at once.

Of the three systems, and purely from a spreadsheet viewpoint, my preferred integrated system is Lotus 1-2-3. It offers everything you could reasonably expect from a spreadsheet system but very little else. The other systems are very much clogged up with word processing *et al* —not of much interest to the dedicated financial modeller. Lotus offers a trade-in for 1-2-3 to Symphony, so you can always opt for Symphony at a later date, which will handle anything you created with 1-2-3. However, if your prime interest is databases then you might plump for Framework, as it's also compatible with Ashton-Tate's dBase II.

Stand-alone systems

Most of the spreadsheet software currently on the market is of the stand-alone variety: that is, a single function software package. Although the software is single function, this doesn't always preclude it linking with other applications.

A popular ploy, predating integrated software, is to offer a range of packages all capable of exchanging data with each other. Apart from the comparatively recent Xchange software, but following Micropro's original Star series (Word-

Star, CalcStar, and so on) there has been a number of others, including the Perfect range of software (with PerfectCalc spreadsheet).

Another stand-alone spreadsheet strategy is to implement just the spreadsheet software, but provide a standard format for data transfer to be adopted by other software developers when implementing add-on facilities. Both VisiCalc and MultiPlan do this: VisiCalc has the DIF data interchange format, and Multiplan offers SYLK. Some developers do offer software that can read these formats.

Of these stand-alone systems, I would opt first for Multiplan. I would tie VisiCalc and Multiplan, but relations between Software Arts (VisiCalc's writers) and Visicorp (the publishers) have turned sour of late. This has held up any enhancements to VisiCalc, and it now looks like Software Arts is turning its energies to its later product, TK!Solver.

Financial planning

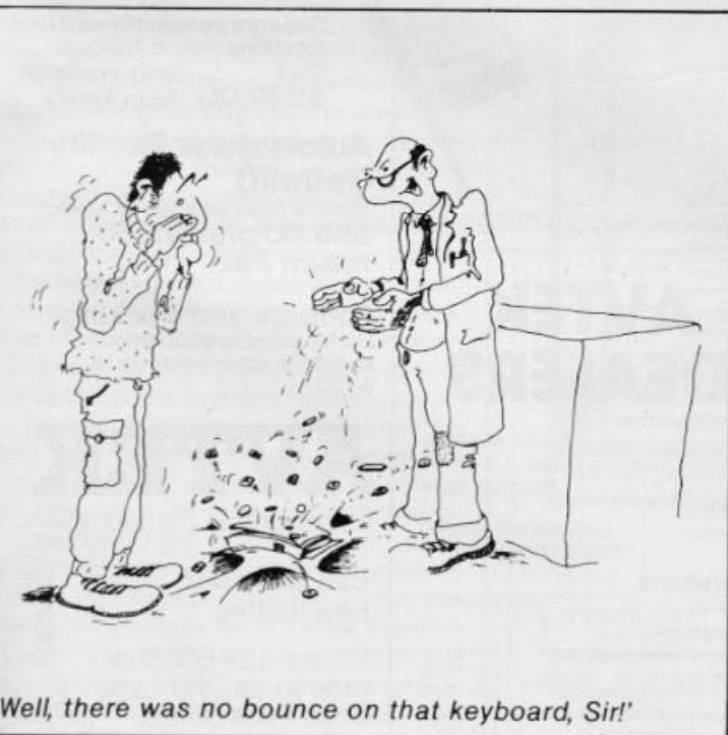
Before spreadsheets existed, mainframe users expended a great deal of time and money on financial planning systems. A financial planning system is a programming language in which the program manipulates rows and columns in a matrix, and generates reports from it. Financial planning systems have found their way onto micros and borrowed some spreadsheet technology on the way. Although the programming language approach is still used, it's also possible for the VDU screen to act as a window onto the matrix.

These systems offer very sophisticated facilities for financial work, but would not appeal to technicians with more mathematically complex models. They are also slower in use, lacking the immediacy of the spreadsheet automatic recalculation facility.

After enjoying little success with the spreadsheet system CalcStar, Micropro waited some time before introducing the financial planning system PlanStar, my favourite. This system is packed with facilities not generally available in everyday spreadsheet software. Notable features include sensitivity analysis, consolidation and goal seeking.

Any user who has been spoilt by contact with some of the high-quality user-friendly micro packages will notice some considerable difference with financial planning systems. Although the concept of a programmable matrix is a good one, most of the financial planning systems have inherited too much of the old-fashioned mainframe approach to computing. You need to work quite hard to get these systems working for you, but it must be said that once they are in operation they offer some very powerful facilities.

Fig 1 shows the Benchtest results for the systems mentioned here. Note that the results are reprinted from the original reviews, where reviews were conducted, or at the time of release and do not take into account manufacturers' enhancements. Note also that not all versions of the products are covered by these tests, and in several instances the software is available on more than one operating system.



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Filevision: data with meaning

Will the Filevision database, with its unusual terminology and use of graphics, help to dispel fears that the Macintosh is just an 'executive toy'? Peter Bright thinks so.

The problem with micros in business is that they have a nasty habit of taking once meaningful data and turning it into uninformative figures.

Database programs are often the worst offenders. Take something like stock control: at the start of the chain, the data means something tangible — someone has to go out and count how many widgets you've got. But by the time the computer has had a good munch at the data, you have to think hard about the difference between a widget and a wombat.

Another problem is that building database programs can be a pain. Of all the popular applications, database management is the only one that forces you to dive some way into the works of a micro and get your hands dirty. With a word processor, spreadsheet or graphics program the worst thing you might have to do is think of a new filename. But with a database you have to work out the file structure and field types and, in most cases, field lengths — the list is endless. Even then, you usually have to write an ultra high-level program if you want your database to do anything useful.

Filevision for Apple's Macintosh differs from all the other databases I've seen in that it associates an onscreen picture with each record in the database. You not only get data about your item, you get a picture of it too. It also relieves you of the chore of having to specify the data type for each field or even the field length. The net result, according to the advertising blurb, is that even a computer-naïve Macintosh user can

create and use a database with a quick flick of the mouse.

Filevision is supplied on a single 3½in disk along with a surprisingly thin manual. When you try to copy the dis-

tribution disk, it looks for all the world like you've succeeded. All the files appear to be there and the program gives the impression that it will load, but half way through loading a copy of Filevision

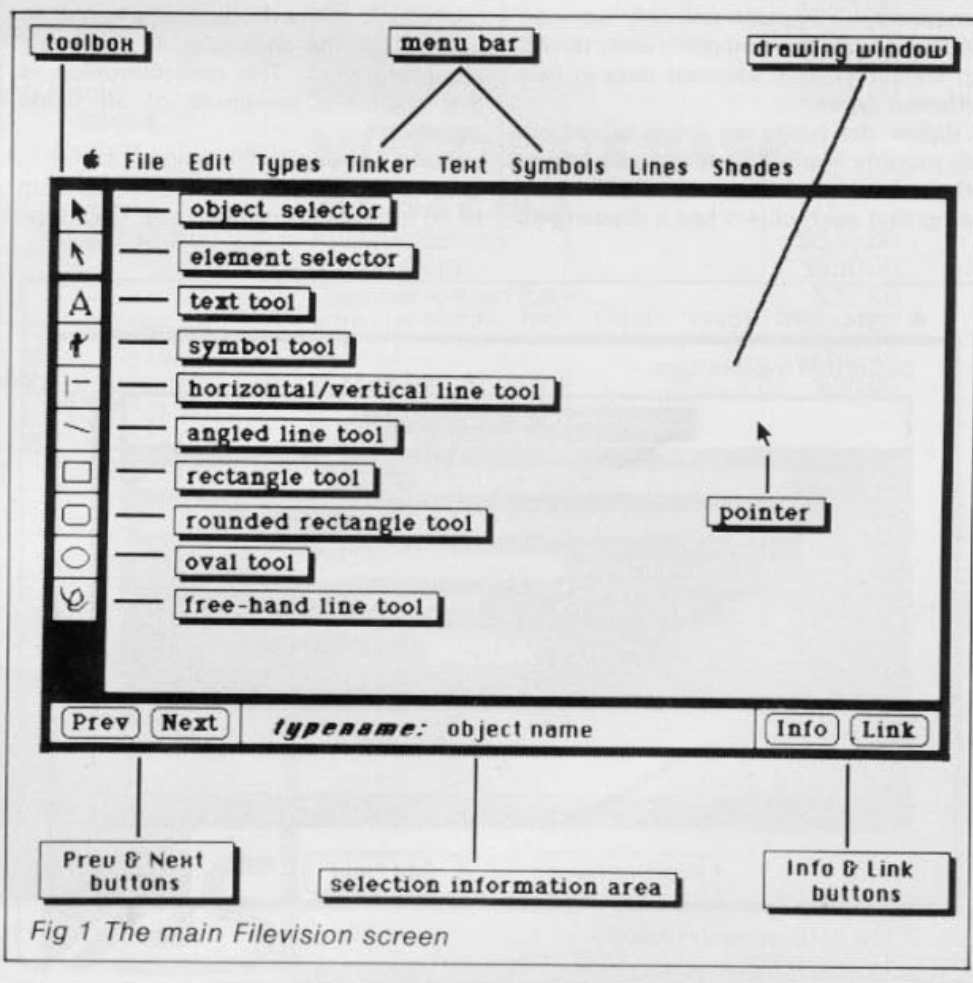


Fig 1 The main Filevision screen

the Mac spits out your disk and asks you to insert the distribution disk. It then reads a few copy-protected routines from the disk and lets you re-insert your copy and carry on.

This is a clever trick and while it does reduce the likelihood of your distribution disk being corrupted, it still means that you're reliant on that one disk.

Before I delve into the workings of Filevision, I'll cover the package's terminology — it isn't the same as is used elsewhere.

The disk file where the data is stored is called the 'drawing file'. The maximum size for a drawing file is 132k, the minimum is 4k, and we'll see later that this needn't be a restriction because you can chain disk files together. You can have as many different drawing files as will fit onto a disk.

At the next level down from the drawing file are 'types'. It's easiest to look on a type as a logical file — think of it in the same way that you would a data file in any other database. When you set up a type, you also define how the data in each record will be structured; each type can have a different data structure. You can have up to 16 types in any one drawing file.

It's worth putting some thought into the way you're going to set up types, because most of the search and printing functions in Filevision will only work on one type at a time. You don't want to end up with important relevant data in two different types.

Below the types are 'objects', which are roughly equivalent to records in any other database; the major difference being that each object has a drawing as

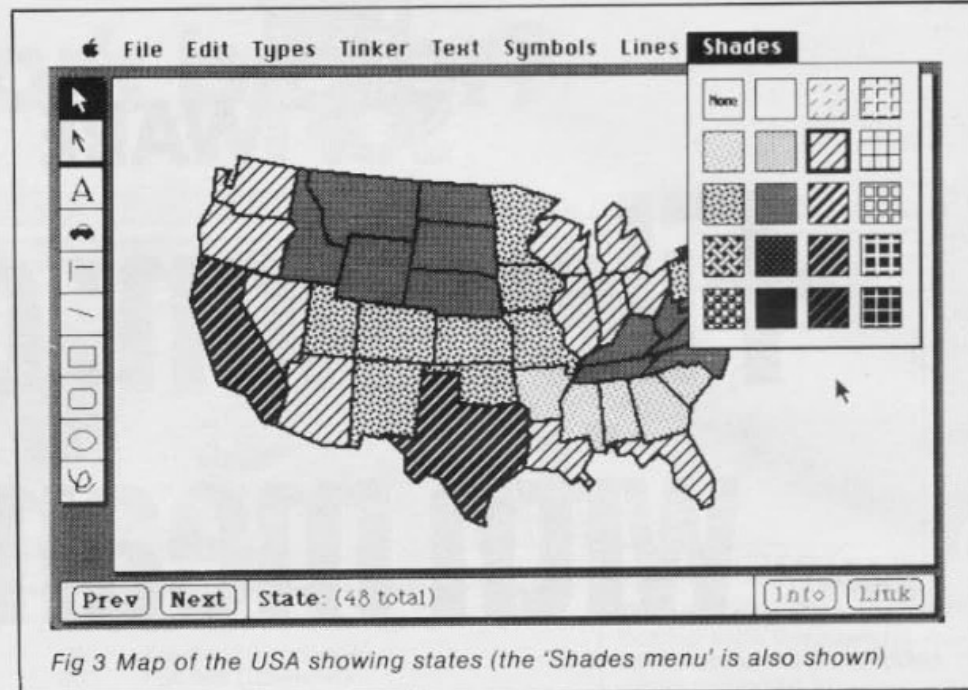


Fig 3 Map of the USA showing states (the 'Shades menu' is also shown)

well as data associated with it. The maximum number of objects per 'picture file' is 999, which cannot consume more than 2k (2000 characters).

Objects are made up of 'data fields'. Both fields and objects are variable length, so you don't need to worry about making fields long enough. You don't need to declare the field type either (alphabetic, numeric, date, and so on), so setting up the structure is extremely straightforward. The only limitation is that there's a maximum of 30 fields per object.

So to sum up, a Filevision disk file is known as a picture file. This contains up to 16 logical files called types. Each type

has a unique data structure made up of objects (records) which, in turn, are made up of data fields.

In use

Filevision can be started in two ways. To open a new file, you select the Filevision ikon from the finder. But if you want to call up a previously saved file, you select the ikon relating to the file and the system automatically loads Filevision and auto-runs your file. You can obviously load and save files from within Filevision too.

Assuming that you're creating a new picture file, the main Filevision screen looks like Fig 1. You'll see that there are nine pull-down menus running along the top of the screen and 10 tools in the toolbox running down the left side. The remaining screen space is taken up by the drawing window, which is blank at the moment.

The first step to creating a new database is to set out a structure for the data in each type. This is achieved using the 'Types' pull-down menu.

The system always has one default type in place called background. This can be used for anything you like, but its usual role is to make the picture look pretty rather than to hold data.

To create a new type you select 'Add Another' from the Types menu which calls up the data definition screen (Fig 2). The system automatically allocates two default lines — Name and Link. Name is used as a key for searches, so it pays to put some thought into the data you put in that name field; link will be described later.

To add a new field, you select the Add

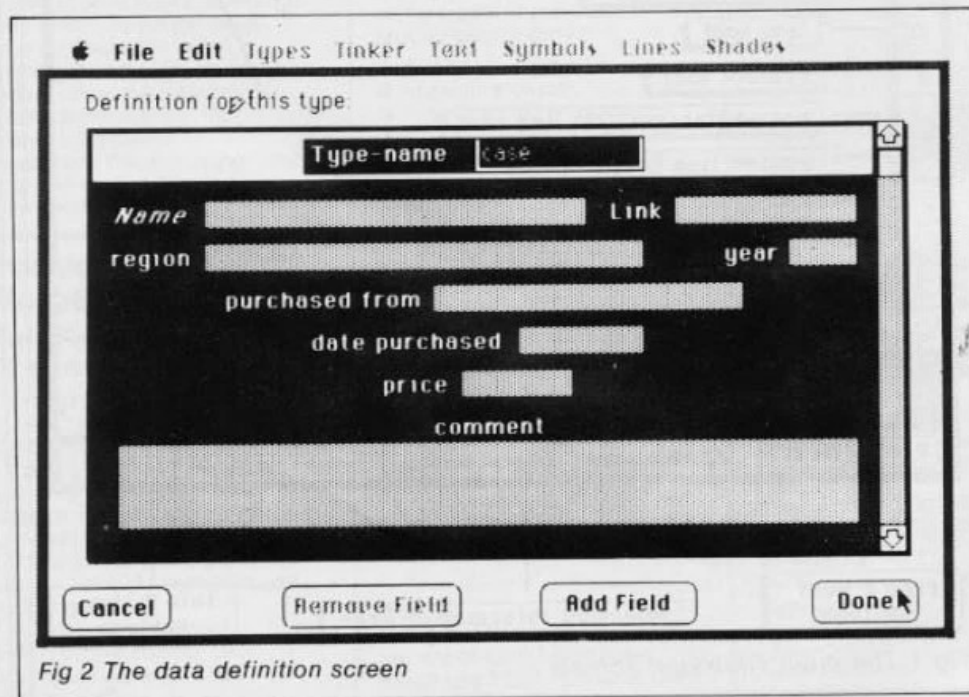


Fig 2 The data definition screen

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Field button at the bottom of the screen. The system then says 'Where?' and the cursor turns into a picture of a hand. To create the field, position the cursor where you want the field to be displayed and hit the mouse button. You then use the mouse to stretch or contract the field size to your heart's content. It doesn't matter if you find later that you didn't leave enough space: just stretch the field with the mouse. You can add or remove fields at any time, even when you've entered all your data. Ah, the wonders of variable length fields.

Using this combination of mouse and variable length, non-typed fields creating the field structure for the different types are very easy.

After you have created all the types and field structures you need, you can progress to the more interesting job of drawing objects.

The easiest way to describe how objects work onscreen is to give an example. If you look at Fig 3, you'll see a map of (most of) the USA broken up into states. The data hiding behind this map gives information on fictitious offices of a company. If you want to know the annual sales of a particular office, just highlight the area and the data screen is displayed.

This picture was created using the 'tools' listed down the left side of the screen; there are eight different drawing tools and two pointing devices. From top to bottom the tools allow you to draw/edit text, symbols, straight lines, rectangles, rounded rectangles, ovals and freehand lines.

Text can be modified in any of the usual Mac ways — different fonts, styles, point sizes, and so on. You can create different symbols using the symbol editor

(Fig 4). The system is supplied with 20 pre-drawn symbols, but you can easily create new ones by calling up and modifying the symbol.

Any enclosed spaces such as rectangles or ovals can be filled with any of 20 different shading patterns using the 'Shades' pull-down menu.

The example picture is made up of forty eight different objects which on their own are only lines and shades, but which together make up the map of the USA. Each object can be individually selected and edited — you can move, expand, contract and even reshape objects at any time.

For every object drawn, Filevision creates a related data record. The structure of the record depends on the type under which the object was created. To enter or view data relating to a particular object, you move the pointer to it using the mouse and double click the mouse button; the system then displays the information screen which you designed when you created the type. Within this screen you're free to enter or amend data and play with field lengths, but you can't add or delete fields (this option is available from the 'Tinker' menu).

The only potential problem with the drawing file is that you have to draw a great many objects on the screen just to make the picture look prettier. This is all very well, but you're left with a corresponding number of empty data records which were created for the superfluous objects. An example of this is the map of the USA where useful data is only associated with the states containing the fictitious company's offices. The remaining states make the picture easier to understand and don't have data associated with them.

It's possible to overcome this problem to some extent by using 'Elements'. You can create complex composite objects by holding down the SHIFT key while you draw the object, which combines the shapes you draw into one object. In this way, you can draw a square within a square which Filevision counts as one object instead of two.

Linking

'Link' is one of the fields automatically created by the system for each object, and is one of the most interesting features of Filevision. If an object has a link entry, the user has the option of calling in a whole new drawing file corresponding to that object from disk. As long as you have enough disk space, you can build up a tree structure of Filevision drawing files.

Let's look at an example. At the top level you have a drawing file showing a map of the world. Each object in the file contains basic details about a country and a link calling a drawing file showing towns in that country. This can go on until you run out of disk space.

The effect of linking is very impressive. To continue the world theme, you could select Australia on the map of the world and be presented with a detailed picture. You could then select Sydney and get a map, select Manly, then a street, and so on down as far as you want to go.

This, of course, is an extreme example. The amount of data and therefore disk space needed to do this is incredible, but it's easy to conceive of projects going one or perhaps two levels down.

The Tinker menu

The quaintly-named 'Tinker' menu allows you to highlight objects which conform to certain criteria. The main options are: 'Hide These', 'Show Only These', 'Highlight All', 'Highlight Some' and 'Ignore'. The Tinker options only work on one type at a time, so before you use them select the type you wish to work on from the types menu.

Hide These allows you to stop the specified type from being displayed onscreen, which is useful for narrowing down the data you're working on. Show Only These removes everything from the display apart from the selected type.

Highlighting is Filevision's way of selecting data that matches certain criteria. Highlight All displays all the objects in the current type in emphasised print. Types which haven't been selected are displayed in a de-emphasised light grey print.

Highlight Some is the most useful of all Tinker's options. It highlights only

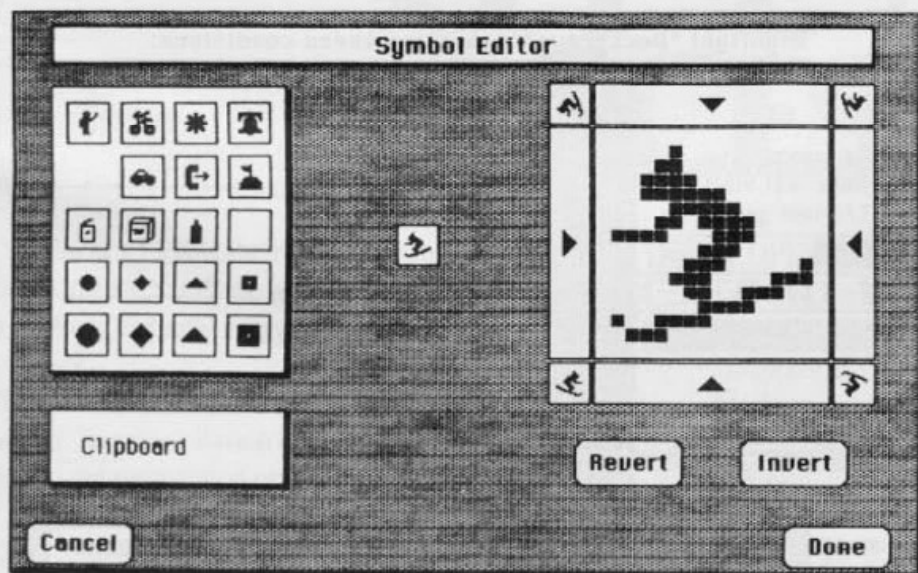


Fig 4 Creating symbols with the symbol editor

those records in the current type which meet criteria you have laid down.

When Highlight Some is selected, Filevision displays the selection screen (Fig 5) which allows you to use the mouse to select objects on up to four different criteria ANDed together. The left side of the screen is used to enter your criteria, and the right side shows what you've entered.

It's possible to use the mouse to enter nearly all the selection criteria; first select the field you wish to work on. The entry box can only display five field names, so if your type contains more than five fields you have to go to a separate screen and decide which ones will be displayed on the selection screen. This works well enough, but it would be easier to scroll through the fields from the selection menu.

Once you have selected the field, you use the mouse to select the criteria. Boxes are provided for the verbs 'is', 'is not', and for the operators 'equal to', 'greater than' or 'equal to', 'less than' or 'equal to', and 'between'.

Finally, you can enter the number or string with which the data is to be compared. If you're doing a string search, Filevision allows you to tune the matching using "'", '"', '...' and '@'.

'...' looks for an exact match at the start of the field. As soon as it has found it, it doesn't bother to look any further in that field. For example, if you specify 'FRED', Filevision matches 'FRED BLOGGS' but not 'RED FRED BLOGGS'. '.' is a wild card match for any character; '@' is a single character wild card; and '@@FRED' will find any occurrences of FRED preceded by any two characters.

The highlighting section's main restriction is that it only allows you to AND a maximum of four criteria. This is fine for most applications, but on one or two occasions I found it a problem.

The only way around it is to apply your four criteria to the current type and then change all the highlighted objects to a new type; this allows you to apply four more selection criteria to the new type. Although this works, it's rather messy and goes against the basic idea of Filevision.

When you choose the Highlight Some option all the objects which meet your criteria are highlighted onscreen, and everything which doesn't is shaded in light grey.

Printing options

In addition to displaying data onscreen, Filevision also produces various printed reports. There are four printing options, all available from the 'File' pull-down menu. The print options work closely

with the screen highlighting options. If you haven't highlighted anything on the screen, the print options will assume that you want all objects in the current type to be printed out. However, if you have highlighted various objects, the print options will only print these.

The first option allows you to dump the screen to the printer. This is available permanently and is useful for getting hard copy of pictures with different highlighting according to different criteria.

The second option is 'Print Info', which prints out all the fields of the selected objects. When it's selected, Filevision allows you to specify headers and footers for the pages along with the field the objects will be sorted on. You can also decide the print quality of the report using the standard Mac printing option box.

The third option is 'Print List', which allows you to create a tailored report based on the selected objects within the current type. In addition to selecting the sort field and the headers and footers, you can also specify how your report should look by specifying fields as column headings across the width of the page. Filevision will then print out the selected fields giving each object a new line. You can specify if the data in each field is printed ranged left, centred or ranged right to make your printout visually pleasing.

The final option is a label printer for printing data onto address labels. The screen shows an outline of a label and allows you to specify where selected fields will be printed.

The report generating options were the only area which disappointed me. Although I can see that setting out data

pictorially on the screen cuts out some of the demand for printed reports, there will still be times when they're necessary.

The printing facilities aren't comprehensive enough to cope. You can only sort out one field at a time, and the sort can only be in ascending order. There's no provision for totalling of fields or value-based page breaks. You're also limited to printing data in column order; if this doesn't suit, bad luck.

Documentation

This consists of one 150-page spiral-bound manual. When I first saw it I thought that it was so short it couldn't hope to cover all the aspects of Filevision adequately — database manuals usually make *War and Peace* look short. After using the manual I can say that not only does it cover every area, but that it's the best manual I've ever used of any kind.

Great use is made throughout of illustrations and emphasised printing. Everything is very well broken up and exceptionally easy to follow. The manual is divided into three sections — Learning Filevision, Using Filevision and Filevision Reference. The first section is a tutorial designed to be used in conjunction with a demonstration file provided on the distribution disk. It's only after you've finished the tutorial that you realise that it's taught you everything you need to know about Filevision.

The rest of the manual just provides back-up — it's the tutorial that does the real work.

Conclusion

I've become bored recently with new business software. While the names may

Fig 5 Selection screen from the Tinker menu

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change, the products remain very similar. Filevision is the first product for a long time which is truly innovative. In the process, it has brought database technology to the point where it can be used by the proverbial ingenious Macintosh user. The use of graphics may at first sight look like a gimmick, but this view couldn't be further from the truth: the graphics allow you to see what the data means.

The biggest bore with any database is usually entering the data. Apple is predicting that a whole new market will develop offering ready-made 'data packs' for use with Filevision. Instead of using printed reports, market research companies and the like could just produce a Filevision drawing file with all the data already installed and distribute it on disk.

If this idea caught on, it could have dramatic effects. Instead of ploughing through pages of printed reports, you could call up the required information and analyse it in your own way. Not only that, but the data is represented pictorially. It's a great idea.

Apple says it hopes that Filevision will do for the Mac what VisiCalc did for the Apple II. Obviously some of this is hype

but it certainly has the potential, especially if the data pack on disk idea catches on.

This product has not only made me rethink my view of databases, but also my view of the Mac. In the past I didn't want the hassle of setting up a database: now it's positively fun. Where I used to regard the Mac as a glorified executive toy with little practical value, I now see it as a potentially very powerful tool cap-

able of much more than I at first thought.

Although Filevision won't solve all database problems, it's still the best piece of new software I've seen during the last year.

Filevision is manufactured by Telos Software and sold by a number of dealers throughout Australia.



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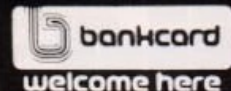
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Caught in a trap

The 'cascading IF syndrome' can plague Microsoft Basic programmers struggling with the problems of data validation. Ron Yuen has the cure.

Many programmers never use the error trapping features available in Microsoft Basic. Others may not even realise why they exist, and what can and cannot be done with them. So for all you that haven't used them or don't, here are some useful ideas.

The standard reason as to why the command

ON ERROR GOTO <line number> exists is usually to enable errors to be dealt with by the program — as opposed to letting it crash as would otherwise happen. This is very true but not very informative. What sort of errors? Logic, data, input, disk and catastrophic errors are all common.

In my view, it's better to look on the command as a powerful aid to verification and validation techniques.

Microsoft Basic, in the Extended and Disk versions (as used under CP/M, for instance), can recognise 47 different error conditions. When a program is running and an error condition is detected by the interpreter (or compiler run-time module), an appropriate code number is allocated to the reserved function ERR, the line number generating the error is stored in another reserved function ERL, and program execution is terminated with the error messages displayed.

If the error happens to be in the program logic, then a crash is what you deserve. On the other hand, many error conditions are generated because information typed in at the keyboard is incorrect or not what the program expects. A good applications program will be able to handle these kind of errors in a controlled way *in-house*, and it's because of this feature that I consider error trapping to be a validation tool.

If an error is detected (some errors can't be trapped) once error trapping has been enabled by the ON ERROR command, control will pass to the specified line number. To get back into the main program a RESUME, RESUME NEXT, or RESUME <line number> command must be issued.

Error codes

The Microsoft Basic manual describes all 47 error messages in some detail.

Numbers 1 to 30 are mainly errors arising from faulty syntax or bad program logic. However, one or two of them might conceivably arise on pur-

pose, and program flow can be re-directed if they are detected.

Error codes 50 to 67 inclusive are concerned with various Disk Errors and it is here that error trapping is at its most useful.

To see how things work let's write a rough program outline for a practical

```

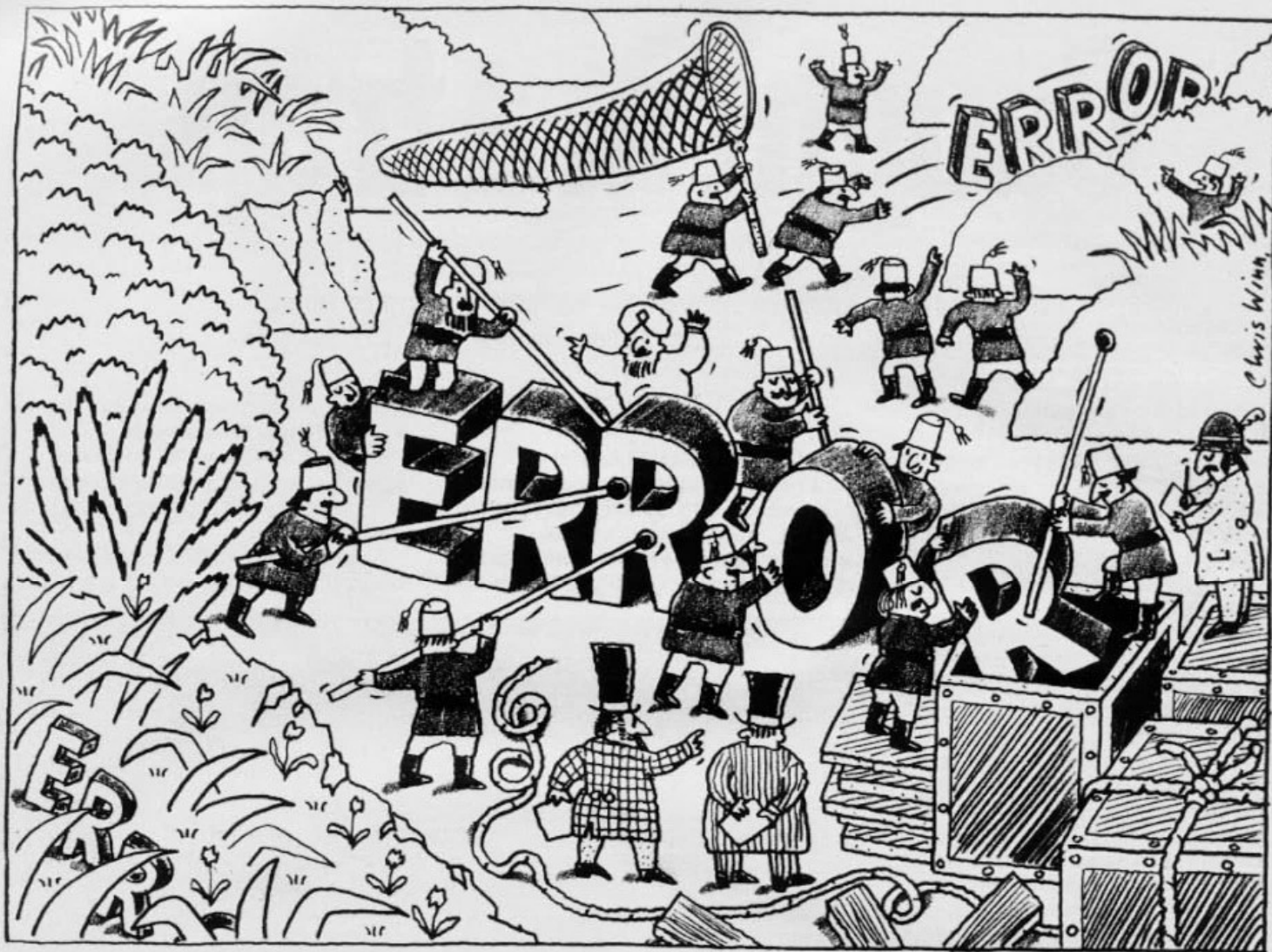
100 REM ***** Main program *****
120 PRINT "Input name of Data File" : INPUT FILENAME. TWO$
140 PRINT "Input name of Report File" : INPUT FILENAME. THREE$
160 PRINT "Input name of Code File" : INPUT FILENAME. FOUR$
180 GOSUB 1000 ' search the data files
190 STOP ' *****
1000 REM first subroutine
1010 OPEN "1", 2, FILENAME. TWO$
1020 OPEN "0", 3, FILENAME. THREE$
1030   FOR X = 1 TO 100
1040     INPUT #2, CODE%, INFORMATION$, AMOUNT
1050     GOSUB 1500 ' search for matching name
1070   NEXT X
1080 CLOSE 2
1090 KILL "OLDDATA.BAK"
1100 NAME FILENAME. TWO$ AS "OLDDATA.BAK"
1110 RETURN ' *****
1500 REM search code/name subroutine
1510 OPEN "1", 4, FILENAME. FOUR$
1520   FOR Y = 1 TO CODE%
1530     INPUT #4, NAMES$
1540   NEXT Y
1550 RETURN ' *****

```

Listing 1 Main program

Line	ERR	Probable reason
1010)	53	Wrong filename typed
1510)		
1020)	61	Disk is full
1040)		
1530)	67	Directory is full
1040)	13	Wrong filename but it exists and records are in a different format
		Possibly filename is OK but data is corrupted
1100	58	"OLDDATA.BAK" already exists
1010)	62	End of file reached and data not found
1510)		
1010)		
1020)	64	Incorrect filename format
1510)		

Fig 1 Potential program problems



problem. In order to keep things simple the program (Listing 1) is written in 'pseudo-MBasic' using occasionally

crude methods.

The program fragment (Listing 1) deals with a typical situation in busi-

ness programming, or indeed any file-handling job. Data is read from one file as a result of which (and depending on the data) a second file needs to be accessed to get yet more data. Finally, selected data items from both files are written to a third file.

Ignore the fact that the subroutine at 1500 is inefficient: it illustrates the point very well. Looking at what could (very easily) go wrong with the program, not through faulty logic but just from having *bad data forced in*, possible sources of problems are shown in Fig 1. Any of these errors will lead to a program crash but they are all easy to trap. ERR 62 is best trapped using the EOF function, and not by the ON ERROR techniques. For example use a line like: IF EOF(file number) THEN <action>

For the rest the first thing to do is initialise the error trapping routine. The best place to do this is right at the start of the program. In our example simply insert the line:

110 ON ERROR GOTO 2000

Immediately an error is detected the program will jump to line 2000 with the variables ERR and ERL set.

At line 2000 we must insert a routine

```
130 WRONG.FILES = FILENAME.TWOS :
    NAME FILENAME.TWOS$ AS FILENAME.TWOS
150 WRONG.FILES = FILENAME.THREES :
    NAME FILENAME.THREES$ AS FILENAME.THREES
170 WRONG.FILES = FILENAME.FOURS :
    NAME FILENAME.FOURS$ AS FILENAME.FOURS
```

Fig 2

```
2010 IF ERR=64
    THEN PRINT WRONG.FILES;" is in the wrong format ! ";
    RESUME <ERL - 10>
```

Fig 3

```
2010 IF ERR=64
    THEN PRINT WRONG.FILES;" is in the wrong format ! ";
    RESUME 2020
2020 ' a re-routing routine for ERR=64
2030 IF ERL=130 THEN RESUME 120 :
    IF ERL=150 THEN RESUME 140 :
    IF ERL=170 THEN RESUME 160 :
```

Fig 4

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to correct or ignore the error, as appropriate, and take any necessary action to correct consequential errors.

For example, we could start with Listing 2. But this already makes things look very cumbersome. While it's OK as far as it goes—which isn't very far—it's time to rethink.

Firstly, lines 2030 and 2050 are going to have to make fairly complex decisions as to what to do with data already processed and written into FILENAME.THREE\$.

Secondly, there is a lot of almost duplicated code in lines 2060 to 2080. Can this be reduced?

Thirdly, we have run smack into a major problem. We are in the middle of an error trapping routine. *We can not trap any errors generated in this section* as all errors detected in an error trapping routine are terminal.

Since we are inputting data in our error trapping routine, we are asking for trouble. As trouble is what we are trying to avoid, different methods must be adopted.

The solution, in principle, is easy. *Trap your errors at source, that is at the moment of first entry into the computer.* This is the first, and most important, law of data processing. Garbage, once admitted, wreaks havoc out of all proportion to the effort required to filter it out in the first place. So, what can be caught at source? The obvious thing to check is if the file name format is correct—and also check to see if the file already exists, otherwise something important might be overwritten.

Let's start again with a clean slate and delete the whole error trapping attempt.

The NAME <old filename> AS <new filename> command can be used to check the file name format. The NAME command demands that <old.filename> exists and that <new.filename> doesn't. If this is not so, then useful ERR messages are generated. Using our example, insert the lines shown in Fig 2.

By introducing a new variable — WRONG.FILES\$ — at this stage we can cut down the code needed in our error trapping routine.

Logically we ought to check first for correct file name format (Fig 3).

We are getting tidier, but unfortunately since ERL is a reserved variable we cannot use the syntax RESUME ERL-10 so we have to cheat (Fig 4).

Looks OK? Well, it's not! This is a classic trap for the unwary, perhaps it should be called the 'cascading IF syndrome'.

It's not the logic that's at fault but the syntax. What happens is that if the test

for the first part of line 2030 fails, then the rest of the line is ignored.

The answer is to write each 'IF' test as a separate line, or include the 'ELSE' test and make sure that all the tests are nested correctly. This is the method I prefer, so what we should have written is shown in Fig 5.

If we then get a bad file format typed in we are forced straight back into the input routine, until we have input an acceptable format.

Two of our files are input files and as such it is necessary that they exist. The third file is an output file and if it doesn't exist, then the interpreter will create it

```
2010 IF ERR=64
      THEN PRINT WRONG.FILES;" is in the wrong format ! " :
      IF ERL=130
      THEN RESUME 120
      ELSE IF ERL=150
      THEN RESUME 140
      ELSE IF ERL=170
      THEN RESUME 160
```

Fig 5

```
2000 REM ***** Error Trapping *****
2010 IF (ERR=53) AND (ERL=1010)
      THEN PRINT "Can't find "+FILENAME.TWOS;
      "Please re-enter " :
      INPUT ; FILENAME.TWOS : RESUME
2020 IF (ERR=53) AND (ERL=1530)
      THEN PRINT "Can't find "+FILENAME.FOURS;
      "Please re-enter " :
      INPUT ; FILENAME.FOURS : RESUME
2030 IF (ERR=61) OR (ERR=67)
      THEN PRINT "No room on the disk ! " :
      PRINT "Insert name of file to delete " :
      INPUT ; FILE.TO.DELETES :
      KILL FILE.TO.DELETES : RESUME
2040 IF (ERR=13) AND (ERL=1040)
      THEN PRINT "Can't recognise this data ! " :
      PRINT "Is "+FILENAME.TWOS;" the right file ? " :
      INPUT(1) ; ANSWERS :
      IF ANSWERS = "Y"
      THEN PRINT "Data is corrupt" : END
      ELSE <get the right filename,
      correct mistakes so far &
      resume>
2050 IF (ERR=13) AND (ERL=1530)
      THEN PRINT "Can't recognise this data ! " :
      PRINT "Is "+FILENAME.FOURS;" the right file ? " :
      INPUT(1) ; ANSWERS :
      IF ANSWERS = "Y"
      THEN PRINT "Data is corrupt" : END
      ELSE <get the right filename,
      correct mistakes so far &
      resume>
2060 IF ERR=58 THEN KILL "OLDDATA.BAK"
2070 IF (ERR=64) AND (ERL=1010)
      THEN PRINT FILENAME.TWOS;" is the wrong format " :
      PRINT "Please re-enter " :
      INPUT FILENAME.TWOS : RESUME
2080 IF (ERR=64) AND (ERL=1020)
      THEN PRINT FILENAME.THREE$;" is the wrong format " :
      PRINT "Please re-enter " :
      INPUT FILENAME.THREE$ : RESUME
2090 IF (ERR=64) AND (ERL=1510)
      THEN PRINT FILENAME.FOURS;" is the wrong format " :
      PRINT "Please re-enter " :
      INPUT FILENAME.FOURS : RESUME
```

Listing 2



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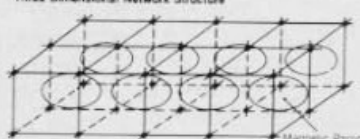
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```

2020 IF ERR=53
    THEN IF ERL=150
        THEN RESUME NEXT
        ELSE PRINT WRONG.FILES;
            "doesn't exist, try again " :
            IF ERL=130
                THEN RESUME 120
                ELSE IF ERL=170
                    THEN RESUME 160
2030 IF ERR=58
    THEN IF ERL=150
        THEN PRINT WRONG.FILES;
            "already exists, Overwrite ? " :
            GOSUB <get yes-no> :
            IF <yes>
                THEN RESUME NEXT
                ELSE RESUME 140
            ELSE RESUME NEXT
    
```

Fig 6

```

2100 REM ***** GET YES NO *****
2110 ANSWERS = INKEY$ : IF ANSWERS = "" THEN 2110
2120 ANSWERS = CHR$(ASC(ANSWERS) AND &H5F) ' upper-case
2130 RETURN
line 2030 then becomes
2030 IF ERR=58
    THEN IF ERL=150
        THEN PRINT WRONG.FILES;
            "already exists, Overwrite ? " :
            GOSUB 2100 : IF ANSWERS = "Y"
                THEN RESUME NEXT
                ELSE RESUME 140
            ELSE RESUME NEXT
    
```

Fig 7

for us as line 1020 is executed. This could also lead to a problem as it may result in a file being overwritten accidentally. Fortunately, we already have enough ERR information to avoid

this and to check for file existence/duplication.

Note that because of the complexity a GOSUB has been introduced into the error-trap to get a yes/no answer. It will

often be necessary to use subroutines in error trapping. Fig 7 shows how to write the program.

Here is an example of the use of the RESUME NEXT syntax. In this case, if we'd answered 'Y' to the overwrite question, then RESUME would have left the program in an infinite loop on the error line, but we have chosen to disregard the error and continue with the next statement.

There is an important point here regarding the use of the GOSUB. Routines that require additional keyboard input should be used sparingly in error trapping. The reason is that once in an ON ERROR routine all subsequent error trapping is disabled, until a RESUME command has been issued. In this case we are only looking for a one character input and so can use INKEY\$ with safety. If more complex data needs to be input, then beware! The picture is looking clearer now but we still have to rewrite the sections checking for Disk/Directory full errors and look at the problem of Type Mismatch errors.

To solve the Disk/Directory full problem, it is necessary to give the error routine the capability to delete a disk file to make room. This can be a dangerous thing to do in its own right, so we need to be able to 'protect' important files against erasure.

A simple way to do this is to draw up a list of files that you are *not allowed* to erase, and to compare the erasure request with this list using the INSTR command to search the list (Fig 8) where 2200 is the deletion routine.

We are still not home and dry as END

```

2200 REM ***** Delete a file routine *****
2210 OLD.ERL=ERL ' remember original ERL to enable correct return to main program
2220 ON ERROR GOTO 2300
2230 PROTECTED.FILE.LIST$ = "<file1file2 . . . file99>"
2240 PRINT "Input name of file to delete";
2250 INPUT FILE.TO.DELETES$
2260 IF INSTR(PROTECTED.FILE.LIST$,FILE.TO.DELETES$) > 1
    THEN PRINT "Protected file — try again " :
        GOTO 2240
2270 KILL FILE.TO.DELETES$
2280 ' now we have to get back to the main program we can't use ERL because we may have generated a new one
    since entering this routine
2290 IF OLD.ERL=1020
    THEN GOTO 1020
    ELSE IF OLD.ERL=1060
        THEN GOTO 1060
2300 REM delete a file error trapping
2310 IF (ERR=53) OR (ERR=64)
    THEN PRINT "No such file — try again " :
        RESUME 2240.
2320 IF (ERR=55)
    THEN PRINT "Can't delete that one, try again " :
    
```

Listing 3

PROGRAMMING

```
2040 IF (ERR=61) OR (ERR=67)
    THEN PRINT "Disk is full. Delete a file ? " :
        GOSUB 2100 : IF ANSWERS = "Y"
            THEN RESUME 2200
        ELSE END
```

Fig 8

could leave us with files of indeterminate content. In other words the disk might fill half way through writing the file and we might choose not to delete. If this happens we will have a file — FILENAME.THREE\$ but no means of telling how many records have been written. Whether or not this is critical will depend on your application. I would DELETE the partially written file, take a new disk and re-run the whole program.

Why, you may ask, can't you GOSUB 2200? You could, but remember that in an error trapping subroutine, error trapping is disabled... we must issue a resume first to re-enable (Listing 3).

Conclusion

These examples of the right — and wrong — approaches to validation should ease a few programming problems, although the routines obviously still need some work. More importantly, some general points can now be made about error trapping.

Firstly, *always* use a RESUME to get back into the main program or any of its other subroutines. If you are in a subroutine and an error is detected which requires you to RETURN to the main program, then *don't just issue a <return> command*. The command

will be obeyed but the whole error trapping system will be disabled, and the subroutine Stack may behave in an unexpected manner. The correct answer is to RESUME at the line number at the end of the subroutine you are in.

Secondly, it's good practice to end all the error trapping tests with the command.

ON ERROR GOTO 0
which will terminate and print any error not allowed for. This then becomes a 'safety-net' to catch errors for which recovery is not possible or practical.

Thirdly, error trapping can quickly degenerate into a spaghetti-like shambles of GOTOs. Since proper structuring is almost impossible to achieve, it pays to keep the traps modular, small and close to the source of trouble, if possible. It may mean duplicating code but it's usually worth it.

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VIC 20 CONTROLLER

This VIC controller program may be the answer to many problems, as well as an innovative way of achieving new screen displays.

It effectively gives you two VIC chips: one operating on top of the screen, the other on the bottom. The change-over point can be altered, as shown in the first demo program. This sets up the system, and sets two different screen and border colours, but because of the routine they both appear onscreen at the same time, one in the bottom half, the other in the top.

The program then alters the changeover point. The second demo program turns on just one sprite, but shows that it's displayed

twice by the swapping of the registers.

To use the routine, issue the SYS command as in the demo files, then treat the two areas of memory (defined as VIC1 & VIC2) as the normal VIC chip. VIC + 32 is the usual address of the border colour. To set the border colour of the top of the screen, just use VIC1 + 32 in place of VIC + 32. For the bottom of the screen use VIC + 32.

The changeover point can be changed: for example, allowing a small text screen at the bottom and a large hi-res screen at the top. It's best to play about with the demo programs to get the feel of the system, then to write your own program. Don't forget to run the loader program first to load in the control code.

Steve Mehew

```
10 REM VIC CONTROLLER BASIC LOADER.
20 REM (C) STEVE MEHEW 1984.
30 :
40 S=49152:E=49332
50 FOR R=S TO E:READ A:POKE R,A:NEXT
60 PRINT"DATA COMPLETE.":END
70 :
400 DATA 32,45,192,120,169,60,141,20
405 DATA 3,169,192,141,21,3,169,200
410 DATA 141,18,200,173,17,200,41,127
415 DATA 141,17,200,169,127,141,13,220
420 DATA 173,13,220,173,26,200,9,1
425 DATA 141,26,200,88,76,162,46,187
430 DATA 0,200,157,0,206,157,0,205
435 DATA 202,16,244,76,162,17,187,0
440 DATA 206,157,0,200,202,16,247,162
445 DATA 21,187,0,206,157,0,200,232
450 DATA 224,25,200,245,162,27,189,0
455 DATA 206,157,0,200,232,224,47,200
460 DATA 245,169,120,141,20
465 DATA 3,169,192,141,21,3,169,251
470 DATA 141,18,200,169,1,141,25,200
475 DATA 76,188,254,162,17,189,0,205
480 DATA 157,0,200,202,16,247,162,21
485 DATA 189,0,205,157,0,200,232,224
```

```
490 DATA 25,200,245,162,27,189,0,205
495 DATA 157,0,200,232,224,47,200,245
500 DATA 169,60,141,20,3,169,192,141
505 DATA 21,3,169,200,141,18,200,169
510 DATA 1,141,25,200,76,49,234,202
```

READY.

```
100 REM TEST PROGRAM FOR CONTROLLER 1
110 :
120 REM WRITTEN BY STEVE MEHEW --- 1984
130 :
140 V1=52736:REM PSEUDO VIC #1
150 V2=52480:REM PSEUDO VIC #2
155 VA=49320
160 :
170 SYS 49152:REM START ROUTINE
180 POKE V2+32,0
190 POKE V1+33,0
195 GOSUB 400
200 :
210 FOR LINE=70 TO 230
220 POKE VA,LINE
240 NEXT
250 :
260 FOR LINE=230 TO 70 STEP-1
270 POKE VA,LINE
290 NEXT
300 :
310 GOTO 210
320 :
400 PRINTCHR$(147):PRINT
410 PRINT"WATCH THE SPLIT LINE MOVE..."
430 RETURN
```

READY.

```
100 REM TEST PROGRAM FOR CONTROLLER 2.
110 :
120 REM WRITTEN BY STEVE MEHEW --- 1984
130 :
140 V1 = 52736
150 V2 = 52480
155 VA = 49320
160 :
170 SYS 49152:REM START ROUTINE
180 :
190 REM SET UP SPRITE (ONLY ONE !!!)
200 POKE V1,100:REM X COORD
210 POKE V1+1,200:REM Y COORD
220 REM POSITION ONE SPRITE AT 100,200
230 POKE V1+37,1:REM COLOUR=WHITE
240 REM
250 POKE V2,100
```



```

260 POKE V2+1,100
270 POKE V2+39,1
280 REM
290 POKE V1+21,1:POKE V2+21,1
291 REM ABOVE SHOWS ONLY ONE SPRITE
292 REM IS ACTUALLY TURNED ON.
300 REM
310 POKE VA,150:REM SWITCH AT LINE 150
320 REM
330 POKE 2040,13
340 FORR=0 TO 62:POKE 832+R,192:NEXT
350 REM
360 POKE V1+16,0:POKE V2+16,0
370 END

```

READY.

ATARI OUTPUT DEVICE

This subroutine allows you to change the Atari's standard output device (the standard output is where all system messages, PRINT statements, and so on appear, and normally this is the screen). With this subroutine, you can specify another device (usually a printer) and save yourself the bother of writing everything twice using PRINT & LPRINT. The routine will work regardless of operating system, or even if you have superseded the normal device driver by adding a new device handler.

Simply type `STDOUT$ = "P:"` or `STDOUT$ = "E:"` (depending on whether you want printer or screen output), then `GOSUB 10000`. Everything will be then sent to the chosen device.

```

10 DIM STDOUT$(2):
REM DECLARE THE
STRING FOR USE
THROUGHOUT THE
MAIN PROGRAM
AND IN THE
SUBROUTINE ITSELF

```

MAIN PROGRAM

```

10000 FOR DEVICE = 830
TO 794 STEP -3: IF
PEEK (DEVICE) = ASC
(STDOUT$) THEN
HANDLER = PEEK
(DEVICE + 1) + 256 *
(PEEK (DEVICE + 2)):
POP: GOTO 10020
10010 NEXT DEVICE: PRINT
"NO SUCH DEVICE":
RETURN
10020 POKE 838, PEEK
(HANDLER + 6):
POKE 839, PEEK
(HANDLER + 7):
RETURN

```

F O'Dwyer

COMMODORE 64 PRINT AT

The use of cursor controls within a print statement on the Commodore 64 allows flexible use of printing, but inevitably results in statements containing large numbers of cursor control characters which are almost impossible to read on a printer. What is needed is a PRINT AT command, which is provided on some

machines such as the Tandy.

Here is a short machine code routine (only 29 bytes long) which is accessed by a SYS call, followed by the x coordinate (0-39) and the y coordinate (0-24). 0,0 is the top left-hand corner.

The routine is fully relocatable, and by letting the variable AT be the address of the routine in memory, the call is easy to read and understand. For example: `SYS AT,x,y: PRINT B$`

The program is split into

two parts: the first loads the routine at address ADDR; and the second is a very short demonstration showing the command's ease of use.

This routine does not affect the print routine at all.

The routine

```

10 REM M/C PRINT AT
ROUTINE
20 ADDR = 10000
30 COUNTER = 0
40 FOR T = ADDR TO
ADDR + 28
50 :READ D: POKE T,D:
COUNTER =
COUNTER + D

```

```

60 NEXT T
70 IF COUNTER < > 3857
THEN STOP
80 DATA 32, 253, 174, 32,
138, 173, 32, 247, 183,
152, 72, 32, 253, 174, 32,
138, 173
90 DATA 32, 247, 183, 166,
20, 104, 168, 24, 32, 240,
255, 96
100 REM DEMO
110 AT = ADDR
120 PRINT "(CLR/HOME)"
130 SYS AT, 16, 12: PRINT
"SCROFF"

```

D Gristwood

SPECTRUM DRAW TO

One problem with producing graphics on the Spectrum is its lack of a DRAW TO command. Calculating and plotting each point is unnecessary and time-consuming, so I've written a simple routine to make it easier.

After the code has been typed in using the short program in Listing 1

RANDOMIZE USR 32000 will create a line from the last point plotted to the new point specified by the following POKES:

POKE 32007—x coordinate
POKE 32027—y coordinate

You can initialise the graphics cursor by POKEing the system variable

COORDS:

POKE 23677,x

POKE 23678,y

Listing 2 is an example program of the routine in use, showing the amount of time it saves.

Listing 1

```

10 FOR n=32000 TO 32049
20 READ po
30 POKE n,po
40 NEXT n
50 DATA 217,229,217,33,125,92,
62,250,150,79,30,1,210,23,125,30,
255,126,33,7,125,150,79,33,126,
92,62,69,150,71,22,1,210,43,125,
22,255,126,33,27,125,150,71,205,
186,36,217,225,217,201

```

Listing 2

```

1 REM Demonstration
2 REM
3 LOAD ""CODE
4 REM
5 LET step=1
6 LET graph=1000
7 LET a$="Using PLOT"
8 REM
9
10 FOR f=1 TO 2
15 PAUSE 30: CLS
20 POKE 23677,0

```


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```

30 POKE 23678,80
40 PRINT a$
50 FOR x=0 TO 255 STEP step
60 LET y=80+75*SIN (x/128*PI)
70 GO SUB graph
80 NEXT x
85 REM
90 LET step=10
95 LET graph=500
96 LET a$="Using DRAW TO"
97 REM
98 NEXT f
101 STOP
102 REM
500 POKE 32007,x
510 POKE 32027,y
520 RANDOMIZE USR 32000
530 RETURN
600 REM
1000 PLOT x,y
1001 RETURN

```

,6,1,2,1,5,1,6,2,5,2,6,5,6,8,8

INVERSE FILENAMES

This tip might be useful to Apple owners who want inverse or flashing filenames in disk catalogues, as saving or renaming a file in inverse or flashing mode does not work. ("HELLO" as used here is an example only, the routine will work with any legal filename.)

First type INVERSE :
PRINT "HELLO" : NORMAL
<RETURN>

This will print an inverse HELLO on the screen.

Now type RENAME
HELLO,

Before pressing return, use <ESC> and the cursor

keys to position the cursor at the start of the inverse HELLO. Press <ESC> again then go over the inverse HELLO and press <RETURN>. The file should now appear in inverse on the disk catalogue. This also works with FLASH.

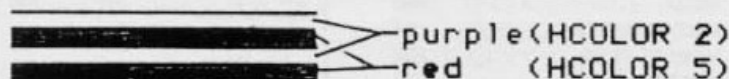
Here are some other useful hints:

CALL 62454 clears the high-res screen 1 to the last plotted colour; CALL -1998 clears text page 1 to inverted a's; CALL -1994 clears top 20 lines to inverted a's; POKE 43624,D is an easy way to change the current disk drive from within a program where D is the appropriate drive number. Be sure to use valid numbers.
G Mountain

EXTRA HCOLORS FOR APPLE

An extra six HCOLORs can be obtained on the HIRES screen by "mixing" certain

standard HCOLORs. This is done by plotting different coloured horizontal lines on alternate rows. Except for black and white, all the other HCOLORs can be "mixed" together. eg. Mixing purple and red as in the diagram will give a magenta color.



The following program will display all twelve HCOLORs.

G Lau

```

10 REM *** HCOLOR MIXER **
20 REM *** BY GEORGE LAU **
30 HOME : HGR
40 READ A,B: IF A=8 THEN END
50 HCOLOR = A: FOR I =
  J TO J + 8 STEP 2
60 HPLLOT 0,I TO 279,I: NEXT
70 HCOLOR = B: FOR I = J + 1
  TO J + 9 STEP 2
80 HPLLOT 0,I TO 279,I: NEXT
90 VTAB 22: HTAB 1: PRINT
  "HCOLORS ";A;" AND ";B
100 PRINT "PRESS ANY KEY
  TO CONTINUE";
110 GET A$: J=J+12: GOTO 40
120 DATA 1,1,2,2,3,3,4,4,5,5,6

```

'BEE AUTO-START

In reply to M O'Connor's question published in the November issue of APC, yes, a Basic program can be made to auto-start on the MicroBee. All one needs is a little understanding of the Monitor in either the Terminal or WordBee ROM.

The solution is simply to go to the Monitor by pressing M & RESET at the same time for 1 second and then release the RESET key first. Then load your Basic program in with R <c/r>. What appears on the screen will look, for example, like:

```
NAME B 08C0 1000 1000
```

The first number 08C0 in Hex is the program start address. The next 1000 Hex is the program length. Simply add these numbers together and subtract 1 (ie, 18BF). Then save the program from the Monitor by entering:

```
D "NAME" M 08C0 18BF 801E <c/r>
```

D will Dump program at 1200 baud. Use W for 300 baud.

"NAME" is the program name (max. six letters) between quotes.

M to save as a machine language program.

08C0 is start address in Hex.

18BF is end address in Hex.

801E is jump address to auto start Basic programs.

When the above program is loaded-in as normal it will auto-start. If the first line of the program is:
00010 POKE 162,30: POKE 163,128: POKE 140,1
then the classroom "whizz kid" cannot stop the program with the BREAK key and it will always restart with a press of the RESET key. As many copies of the program as you like can be saved through the monitor as well.

A Laughton

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TEACH YOURSELF LISP

Dick Pountain concludes his 'Teach Yourself' series with a look at the important fringe features of the language.

This month I'll examine several important but unrelated features of Lisp that haven't yet been covered.

First let's find out how to split the atom. Although Lisp is excellent for list processing, on the evidence so far presented it isn't much use with strings. Names have been treated as if they are atomic; they either exist or they don't but you can't get inside them.

Sometimes we need to break down a name into its individual letters; a good example is the extension of the MATCH function defined last month. I suggested that it would be interesting to use variables instead of * and ?, so that the matched values could be returned to us. In order to do this we need a scheme of variable naming so that the match variables can be distinguished from ordinary list elements. Using a \$ as the first letter will suffice, as in:

(MATCH '\$name likes \$animal) '(fred likes tree-frogs))
which leaves 'name' equal to 'fred', and so on.

To recognise variables in such a scheme, we need a way to inspect the first letter of an atom. Most Lisp dialects have the dramatic-sounding functions EXPLODE and IMplode to accomplish this (sometimes they're called UNPACK and PACK, or IMplode may be called COMPRESS). EXPLODE applied to an atom returns a list of the letters in the atom:

(EXPLODE 'frog)
(f r o g)

Now we can use all the list processing we've learnt to manipulate the individual letters and stick them back together with IMplode, which takes a list of letters and returns an atom. Don't forget that neither function alters the original atom: a new atom is formed,

and it's up to you whether to substitute it for the old one. The function we need can now be defined as shown in Fig 1, and we test the result to see if it's a \$ to recognise variables in the match list.

Lisp is an excellent language for handling databases, and one of the chief reasons lies in a facility that we haven't used called the 'property list'. Without getting too far into the internal workings of Lisp, let's just say that every name which you define has associated with it a list called its property list. When a name is created, this list is empty. You can use the list to give named prop-

erties to an atom, just like the fields in a database record.

If we create a name FRED, it could have properties called, say, GENDER and HEIGHT which are quite independent of any value that FRED might have. In fact the value of a variable which we've been using so far is merely one of its properties, called the 'value property'. The value property is special because it has no name of its own: it's what is returned by Lisp when the name is evaluated, and it's altered by SETQ. Other user-defined properties are manipulated by the functions PUTPROP, GET and REMPROP.

PUTPROP puts a value onto the property list of a name under a property name which is one of its arguments. (PUTPROP 'FRED 'MALE 'GENDER) sets a property called GENDER to the value MALE. Some dialects might take the arguments to PUTPROP in a different order, so check your manual before experimenting.

We can read back such property values with GET:

(GET 'FRED 'GENDER)
MALE

REMPROP (from REMove PROPerTy) removes a property from the list (not just its value but the whole thing), so (REMPROP 'FRED 'GENDER) leaves FRED in the fashionable state of being genderless.

I'm sure your imagination will tell you just how powerful this facility is. It provides a way of creating fully dyna-

```
(DEFINE FIRST-LETTER (NAME)
  (CAR (EXPLODE NAME)))
```

Fig 1 Function to inspect an atom's first letter

```
(DEFINE KEEP-OBJECT (CHARACTER OBJECT)
  (PUTPROP CHARACTER
    (CONS OBJECT (GET CHARACTER 'POSSESSIONS))
    'POSSESSIONS))
```

Fig 2 List of POSSESSIONS property

```
(DEFINE REST-NAME (NAME)
  (IMplode (CDR (EXPLODE NAME))))
```

Fig 3 Defining REST-NAME to FIRST-LETTER

```
(DEFINE MATCH (PATT LIST)
  (COND
    ((AND (NULL PATT) (NULL LIST)) T)
    ((OR (NULL PATT) (NULL LIST)) NIL)
    ((OR (EQUAL (CAR PATT) '?)
         (EQUAL (CAR PATT) (CAR LIST)))
     (MATCH (CDR PATT) (CDR LIST)))
    (T)))
```

Fig 4 First version of MATCH

```
((AND (EQUAL (FIRST-LET (CAR PATT)) '$)
  (MATCH (CDR PATT) (CDR LIST)))
  (SETQ (REST-NAME (CAR PATT)) (CAR LIST)) T)
```

Fig 5 Clause which checks for words beginning with \$

mic databases whose record structure can be changed, pruned or expanded at anytime during a program run. There's no limit on the number of properties an atom can have, save that of memory space.

Let's suppose we're writing an adventure game in which characters pick up and drop possessions. Each character's name has a property called POSSESSIONS, which is a list of what they've picked up so far (Fig 2).

The character and object can be obtained from pattern-match variables. We'll start by defining a complementary function to FIRST-LETTER called REST-NAME (Fig 3), which returns a name with the first letter stripped off. Our MATCH function can now test the first letter to see if it's a \$ (indicating we've found a match variable), then put values in the variables names (without the \$) and these can be used by KEEP-OBJECT. Then perhaps we could do:

```
MATCH '($CHARACTER picks-up ?
      $OBJECT) (READ))
```

to analyse user input expressions such as 'Frodo picks up the Orc-Repellent', and have the Orc-Repellent added to Frodo's list of possessions.

For simplicity's sake, let's use the first version of MATCH which only used ? to match any single atom (Fig 4).

We need to add a new clause to the COND which checks for words beginning with \$. If it finds one and if the rest of the lists match then we have a

variable match, and we want to set the value of the variable to the matched word. A suitable clause appears in Fig 5.

But, unfortunately, this won't work. The SETQ expression will bomb out because its first argument isn't an atom. Remember that SETQ *doesn't evaluate* its first argument, so (REST-NAME . . .) is just so much garbage to it. What we need instead is the related function SET, which we haven't used before, that evaluates both its arguments. (SETQ is just a SET which quotes its first argument for you, which is usually what you want.) SET will evaluate the (REST-NAME . . .) expression and all is well. Test the new MATCH with Fig 6.

Try to extend this variable matching scheme to accept *variables which match any number of atoms (assigned as a list). You could also try using a PROG to read input lists, match things, and add the things to a property list like KEEP-OBJECT does.

The last major Lisp constructs I should mention are the mapping functions. A very common need in Lisp programming is to apply a function to each member of a list in turn and return a list of the results. It's perfectly possible to do this by writing a function as in Fig 7 to apply SQUARE to each element of a list of numbers. The disadvantage is that you'll have to write a new definition for each different function you want to apply in this way. We can make the definition general by passing the function to be applied as a

second argument (Fig 8).

Used as in (DO-TO-ALL '(1 2 3) 'SQUARE), this will return the same answer, (1 4 9), as (SQUARE-ALL '(1 2 3)) does.

You may be worried by this cavalier passing of a function as an argument to another function, but Lisp is happy with it. In general, you may pass functions as arguments just as you pass numbers or lists. Complications can arise if the function passed uses variables which it doesn't bind itself, but some dialects provide a function FUNCTION which should be used instead of QUOTE when passing a functional argument, and this solves any problems.

Most Lisps provide the function MAPCAR (sometimes called MAPC) which does exactly the same thing as our DO-TO-ALL (warning: some dialects have the arguments to MAPCAR in reverse order—that is, function, list). The 'MAP' part refers to the mathematical notion of a 'mapping' rather than the everyday idea of a chart, although the two are connected.

Closely related to MAPCAR is the important function APPLY. APPLY also takes a function and a list as its arguments but instead of applying the function to each member of the list, it passes the list as multiple numeric arguments, rather than a single list argument, to the function. Take the example of PLUS which can (usually) accept any number of arguments, so (PLUS 1 2 3) is 6. If we tried to give PLUS a list of arguments, (PLUS '(1 2 3)), it wouldn't like it one bit. By using APPLY we can make it accept: (APPLY 'PLUS '(1 2 3))

Think of it this way; APPLY takes the function and places it inside the brackets at the front of the list. APPLY is used in the inner workings of the Lisp interpreter, where multiple arguments are always represented by a list.

Don't worry if the difference between these functions doesn't sink in at once. You'll find that you only understand them properly when you use them to solve a programming problem.

As an example of their use, Fig 9 is a function which uses both APPLY and MAPCAR (a very common construction) to count all the atoms in a list.

This will only work if your PLUS can take more than two arguments, and will give an error with a single atom list. Do you know why?

Very often it would be handy to use APPLY or MAPCAR to apply a function that we're only going to use once. It isn't worth defining such a function with DEFINE and wasting valuable memory by giving it a name and permanent

```
(SETQ NAME NIL)
(SETQ EPITHET NIL)
(MATCH '($NAME IS A ? $EPITHET) ' (RUDOLPH IS A BIG WALLY))
NAME
RUDOLPH
EPITHET
WALLY
```

Fig 6 Testing the new MATCH

```
(DEFINE SQUARE-ALL (LIST)
  (COND
    ((NULL LIST) NIL)
    (T (CONS (SQUARE (CAR LIST)) (SQ-ALL (CDR LIST))) ) )
```

Fig 7 Function to return a list of results

```
(DEFINE DO-TO-ALL (LIST FUN)
  (COND
    ((NULL LIST) NIL)
    (T (CONS (FUN (CAR LIST)) (DO-TO-ALL (CDR LIST))) ) )
```

Fig 8 Passing the function to be applied as a second argument

```
(DEFINE ATOMCOUNT (LIST)
  (COND ((NULL LIST) 0)
        ((ATOM LIST) 1)
        (T (APPLY 'PLUS (MAPCAR LIST 'ATOMCOUNT))) ) )
```

Fig 9 Function using APPLY and MAPCAR to count all list atoms

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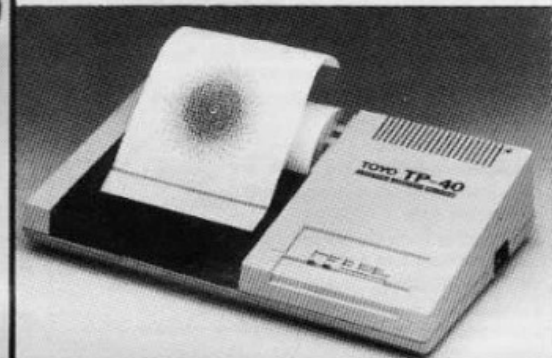
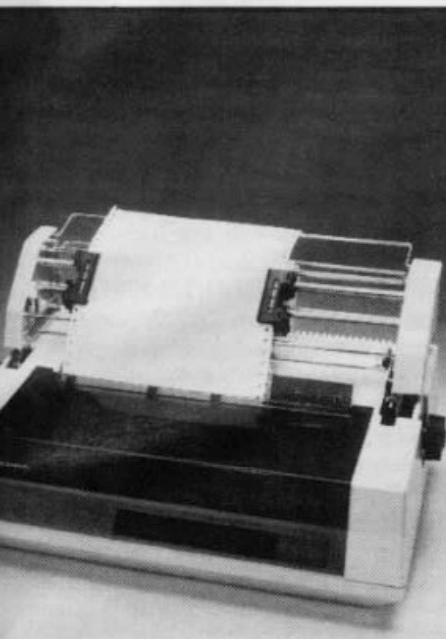


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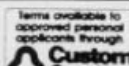
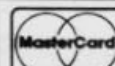
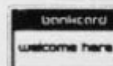


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LN (x)	Log base e
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SQRT	Square Root

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IF (condition, true value, false value)

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LANGUAGES

storage. Instead we can define an 'anonymous' function which is created only where it's needed, using that cryptic word LAMBDA. It's used so:

```
(MAPCAR LIST '(LAMBDA (NUM)
(TIMES NUM NUM)) )
```

The LAMBDA expression defines a function identical to SQUARE (try reading `DEFINE SQUARE` instead of `LAMBDA`), but which has no name and only exists during the evaluation of the `MAPCAR`.

Some readers may be using versions of Lisp (muLisp, for example) which require the function LAMBDA to be used in ordinary definitions. To them I apologise. What's more, *all* versions of Lisp insert LAMBDA into the internal stored form of definitions (just as they expand into (QUOTE editor). I deliberately postponed examination of LAMBDA until this late stage because it's too confusing and alarming to introduce it at the same time as DEFINE. LAMBDA is the function which defines functions and controls the way arguments are passed, but most modern dialects disguise its presence from the user as it means a whole extra level of brackets and makes definitions much less readable.

You should now be convinced of the importance of list processing as a technique. It can model anything from human languages to the construction of DNA (ribosomes as biological Lisp machines?) Lisp is an elegant, at times beautiful, but sometimes exasperating implementation of list processing for computers. Languages like Logo and POP-11 provide a more conventional (and friendly) syntax, Prolog adds the power of automatic pattern matching.

and in the future we might even see Basic with list processing extensions. But in learning Lisp you've started at the right place — the beginning. **END**

This is the final part of our six-part Teach Yourself Lisp series. Back issues can be obtained from our office at 77 Glenhuntly Road, Elwood, Victoria 3184.



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Look back in dismay

The recently held World Microcomputer Chess Championship was full of surprises, as Tony Harrington found out.

Looking back with hindsight at the predictions I made about the likely outcome of the 4th World Microcomputer Chess Championship (WMCC), I find many reasons for dropping the prediction-making habit as quickly as possible (see November *APC*). This World Championship was full of surprises.

The first of these concerned those who weren't there. The Novag Super Constellation was many people's idea of a hot favourite prior to the event. It had beaten all kinds of international masters at blitz chess and had acquired a great reputation in the process. Surely Novag would want to cash in on its potential and claim a WMCC title. But no, instead of an entry form, Novag sent round a circular to everyone except the organisers a week or two before the tournament, stating why these kinds of events were not worth entering.

In golf that would be called playing the percentage shot: if you have a good reputation already, why risk blowing it? However, that wasn't one of Novag's reasons for not entering. It was worried about the absence of any reliable test to differentiate between a genuine 'commercial entry' and something running on equipment way out of reach of most people's pockets. That sounds a reasonable grumble, but it has more to do with marketing nerves than reality. I still think the Super Constellation might have won if it had been allowed a chance (another prediction, but habits are hard to break).

SciSys was a less surprising absence. Nothing had been said before the tournament about a real improvement in the SciSys Superstar program. The word from SciSys was that it was working on one but that it would not be ready in time for the event.

Even with these two manufacturers out of the running, the field was one of the largest ever with nineteen entries beginning and — even more remarkably — finishing the tournament (despite the occasional threat of a walk out, a normal occurrence at these events).

Far and away the most astonishing thing about the tournament, from my point of view, was the reappearance of Conchess, which had three entries. Ulf Rathsmann, the programmer, had been quietly beaver away since Conchess's rather undistinguished initial public performance at a 1982 tournament, and had come up with a program capable of testing the best.

Then there was the Mephisto team, also with three entries. Mephisto had drawn some flak over the last year for releasing a Mephisto III which had the unfortunate habit of losing to the earlier Mephisto II. (New releases are supposed to be better than the old, rather than just different.) So it was nice to see that Hegener and Glazer, the supplier, appeared to have some improvements to offer.

Fidelity, as usual, had a strong array of entries, supplemented by a number of Spracklen programs running on business computers like the Compaq, the Macintosh and the Apple. Intelligent Software entered an experimental program and — good news for home computer owners — Richard Lang and Martin Bryant, two regular participants in what used to be the annual European Tournaments, also had entries.

Lang's Cyrus program, available in one form or another on both the Spectrum and the Dragon, was replaced for this event by a new generation program designed for the Sinclair QL. Sponsored by Psion, which will be

marketing it in the UK, Lang's program (called Psion after the sponsor, undoubtedly a wise decision) ran, for the purposes of the tournament, on an 8MHz Sage computer. It will, he reckons, be slower by a factor of three on the QL, but even so, it looks like being one of the strongest home computer programs in the world. Lang won joint first prize in a four-way tie for first place. This earned him a large bottle of Lang's Whisky (though he assures us he is not related).

Bryant improved on his White Knight program for the BBC with a program called Colossus, which has done very well as a commercial program for the Commodore 64 (see December *APC*). For this event, he entered a souped-up version of Colossus, running on an Apple II.

Last, but not least, there was the solitary amateur entry, Geoff Bulmer's 'Chessnut', a plucky little program running on a Commodore 64 and guaranteed of the best amateur trophy even if it didn't win a game (it didn't).

The seven-round Swiss tournament was held in Glasgow (9 to 15 September). Sponsored by CGL Ltd and Langs Supreme Whisky, in association with Stakis Hotels PLC, my main concern is that unless the Scots feel like an early celebration, we might have to wait another hundred years for a micro tournament to be as well organised and presented.

From the opening ceremony to the grand buffet close, it was a wonderfully organised and run event.

Rounds began at 2pm each day and went through to a *theoretical* 10pm close. I say theoretical because the tournament director, Mike Valvo, a US International Master, made a practice of

Game No 1 Sargon Compaq versus Mephisto B

1 Nf3 d5	20 Nxd2 Qe2
2 g3 Nc6	21 Rfd1 Bh5
3 Bg2 e5	22 f3 Ne5
4 d3 Nf6	23 g4 Nxg4
5 0-0 Bf5	24 fxg4 Bxg4
6 Bd2 Bc5	25 Qa3 Rxd2
7 b4 Nxb4	26 Rxd2 Qxd2
8 Nxe5 Qd6	27 h3 Qd4+
9 Bc3 0-0	28 Kh1 Bd7
10 Nd2 Rf-e8	29 a5 Bc6
11 e4 dxe4	30 a6 b5
12 Nec4 Qa6	31 Rb1 Bxe4
13 Bxf6 Qxf6	32 Qb3 Bxg2+
14 dxe4 Bg6	33 Kh2 Bc6
15 Rb1 Qa6	34 Kg3 Re2
16 a3 Nc6	35 Qf3 Bxf3
17 a4 Bb4	36 Rf1 Qe5-
18 Ra1 Rad8	37 Kxf3 Qe4+
19 Qc1 Bxd2	38 Kg3 Rg2 mate 0-1

This was one of the better games from the tournament. The manner in which Mephisto forces the win is particularly impressive.

Game No 2 Intelligent Chess Software (ICS) versus Chessnut

1 d4 d5	9 f3 Bh5	17 Qc6 Rd1+
2 c4 Nc6	10 Qb3 b6	18 Kxd1 Kd8
3 Nc3 dxc4	11 Qa4+ Qd7	19 Nxc7 Bf7
4 d5 Ne5	12 Bb5 0-0-0	20 Kc2 Kc8
5 Nf3 f6	13 Qxa7 Qxb5	21 Na6+ Kd8
6 Nxe5 fxe5	14 Nxb5 Nxd5	22 Rd1+ Bd5
7 e4 Nf6	15 Qa8+ Kd7	23 Rxd5 mate
8 Bxc4 Bg4	16 Qxd5+ Kc8	24 0-1

Although ICS didn't do well overall, it was quite up to exploiting a poor opening by Chessnut.

call things a draw Valvo was heard to say: 'Let's give it 10 more moves and see what happens...'

The chess played was definitely of a higher standard this year than ever before, but you would have been hard pressed to spot that from most of the games scores.

Computers, even good ones, play boring chess against each other; they allowing play to go on where necessary until the computers either bored their programmers to death or reached a result. If there was the smallest sign of theoretical interest left in the game, he was willing to pace the floor and let the machines fight it out. Even when the programmers themselves wanted to look much more impressive against chess players, when the game takes on more shape and sharpness.

But although it didn't lead to much in the way of spectacular middle game fireworks or witty sacrificial attacks, the increased strength of many of the participants showed up in the large number of end games that were reached (see Games section).

Another indication of the strength of the event is that Martin Bryant's Colossus—which I have always thought of

as a very good program — could only scrape up one and a half points against the dedicated machines.

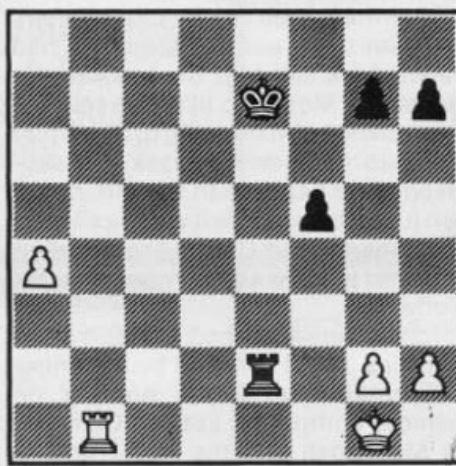
Caithness Glass bowls were presented to the four winners by Professor Monroe Newbarn, president of the ICCA. The actual title of commercial world champion, though, went to the Mephisto A, since it was the only machine among the winners which fulfilled the condition of being currently available in the shops.

The Fidelity Elegance ran at 6.1MHz on a 6502 processor, the Mephisto programs at 12MHz on a 68000 and Princhess (or Conchess) at 6.1MHz on a 6502 chip. Full tournament bulletins are available from Chess Suppliers (Scotland) Ltd, 15 Hope St, Glasgow G2, Scotland.

Games section

White: Fidelity Elite X. Black: Mephisto B. Notes by Grandmaster Dr John Nunn

(The 4th World Microcomputer Chess Championship was notable for the close finish and for the surprising number of interesting end games arising. The reason for this is probably that the struggle between the stronger programs created today is likely to remain finely balanced for a long time. The following fascinating ending was of some sporting interest since the Fidelity Elite X needed to win against Mephisto B to tie for first. We take up the story with the Elite, as White, about to make its 43rd move.)



43 Rb1-a1!

(Although material is level, White has all the chances because the passed a-pawn can be used to deflect Black's pieces from the defence of his kingside pawns. White correctly places his rook behind the pawn to support its advance.)

43 ... Ke7-d6

(Black later decides to blockade the pawn with his rook in any case, so it

would have been better to do this immediately by 43 ... Re2-e6 44 a4-a5 Re6-a6.)

44 a4-a5 Kd6-c7
45 a5-a6 Re2-e8

(Black would have preferred to use his king to obstruct the pawn's advance by 45 ... Kc7-b8 46 a6-a7+ Kb8-a8, so as to leave the rook actively placed, but White can play 45 ... Kc7-b8 46 Ra1-b1+! followed by RB1-b7 attacking the kingside pawns.)

46 Ra1-b1?

(Giving Black unnecessary chances. 46 a6-a7 Re8-a8 47 Kg1-f2 Kc7-b7 48 Kf2-f3 Ra8xa7 49 Ra1xa7+ Kb7xa7 50 Kf3-f4 Ka7-b6 51 Kf4xf5 Kb6-c7 52 Kf5-e6 followed by Ke6-f7 wins the kingside pawns. We shall meet several lines in which the rooks are exchanged, when the result depends on whether White's king can penetrate to attack the g7 and h7 pawns before Black's king comes to the rescue. Here the result is as close as it could be, depending on a single move.)

46 ... Re8-b8

(46 ... g7-g6 47 Rb1-b7+ Kc7-c6 48 Rb7xh7 Re8-e1+ 49 Kg1-f2 Re1-a1 was no better because of the strong reply 50 Rh7-h6!.)

47 Rb1-e1?

(Missing 47 Rb1xb8 Kc7xb8 48 Kg1-f2 winning as before.)

47 ... Kc7-d6
48 a6-a7 Rb8-a8

(White reverts to the correct plan. Black's rook is completely immobilised, so White has time to bring up his king.)

49 ... g7-g6
50 h2-h3 Kd6-c7
51 g2-g4?

(This should have thrown away the win, which could have been forced by the familiar plan of 51 Kg1-f2 followed by a king advance.)

52 ... f5xg4
52 h3xg4 Kc7-b7

(Now we can see the difference. Thanks to the pawn exchange Black can meet 53 Kg1-f2 by 53 ... Ra8xa7 54 Ra1xa7+ Kb7xa7 55 Kf2-f3 h7-h5 exchanging White's last pawn and drawing.)

53 Ra1-b1+ Kb7-c6

(Black could also have taken the pawn, but he has not spoilt anything yet.)

54 Rb1-a1 Kc6-b6
55 Ra1-b1+ Kb7xa7
56 Kg1-f2

(White is in no danger of losing despite his minus pawn, since Black's king is too far away, but equally he should not win.)

56 ... Ra8-f8+
57 Kf2-g3 Rf8-f7

(57 ... h7-h5 was the simplest draw.)

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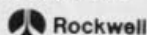
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58 g4-g5 Rf7-f5
59 Kg3-g4 Ka7-a6
60 Rb1-d1 Rf5-f7
61 Rd1-b1 Rf7-b7??

(Mephisto's blunder allows the Elite X to take joint first place. Black only needed to mark time by 61... Ka6-a7 to draw, since White cannot undertake anything positive.)

62 Rb1xb7! Ka6xb7

(White's king is able to win both Black pawns and reach a won position with king and pawn vs king.)

63 Kg4-f4 Kb7-c6
64 Kf4-e5 Kc6-c5
65 Ke5-f6 Kc5-d4

(Or 65... Kc5-d6 66 Kf6-g7 Kd6-e7 67 Kg7xh7 Ke7-f7 68 Kh7-h6 Kf7-f8 69 Kh6xg6 Kf8-g8 70 Kg6-f6 Kg8-f8 71 g5-g6 Kf8-g8 72 g6-g7 Kg8-h7 73 Kf6-f7 and the pawn promotes to a queen.)

66 Kf6-g7 Kd4-e4
67 Kg7xh7 Ke4-f5
68 Kh7-h6 Kf5-e5

(Black has no choice but to abandon his last pawn to its fate.)

69 Kh6xg6 Ke5-e6
70 Kg6-h7 Ke6-d5
71 g5-g6 Kd5-e6
72 g6-g7

(and Black resigned.)

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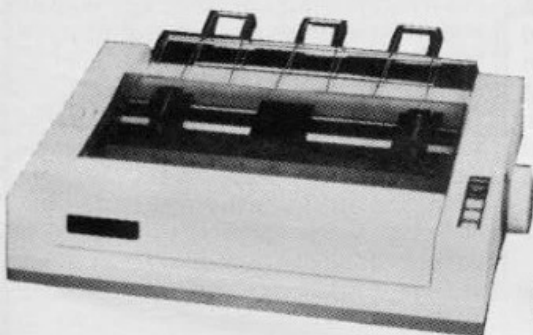
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The biggest slice

Would software manufacturers have more financial success if they tailored their products towards a well-defined market? Martin Banks crossed a few palms to find out.

A few weeks ago, a friend of mine in the computer industry came up with a fascinating but inconsequential fact. In 1983, IBM made \$2.50 profit for every second of my 80-year-old uncle's life. At first I thought that this was the most irrelevant piece of information I had ever heard (unless I was IBM's bank manager, of course), but I played with some numbers and found that in the first quarter's trading last year, the jolly blue giant had made around \$1 profit for every second he has been alive.

to seek a little clarification on the indelicate point of the price tag. What, I wondered, did one get for the \$3,000-plus that had been mentioned? If it was an all-up price, including the hardware, then it looked like a reasonable deal.

'Ah, no,' I was informed. 'That's just the price of the software package.'

Just the price of the software package? Good God. There are companies around the country who could — probably are — writing programs as complex for under \$1,000.

with each new entrant to the market attempting to provide more facilities than the current leading product in any sector at a lower price.

Yet, as has been found many times before (the latest being the home computer hardware market), there's only ever room for two or three successful products in any category and, once these market leaders are, by whatever process, defined, the other contenders are doomed to either struggle or suffer an ignominious failure. That is unless they can offer the user something different, or better.

Then they find that they can even charge for it. They may not sell as many units as the market leaders, but their profitability will often be greater in percentage terms. Such companies are now making the transition towards addressing vertical markets, where they may well find that the pressures are slightly more bearable and the problems slightly less.

As can be seen from the catalogue of software distributors, pick the right vertical market and you can name your own price. Something for the legal profession perhaps, or the building trade — anywhere that's used to shelling out money in large dollops for its product purchasers. These are the markets to go for.

You could spend less time and effort developing a package in those fields than in developing a word processor. You could come up with a package that had seventeen times more the power of WordStar, could run immediately on any machine and cost just \$50 and it still wouldn't sell. With a well-defined vertical market product you're almost guaranteed business. I've heard of customers buying such products, often several copies, just for evaluation purposes, to 'find out what it's capable of.'

At vertical market prices, that can be good business; in the general purpose applications business, it can mean bankruptcy.

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'You may not become a millionaire or reach IBM's enviable financial status but there's good money to be had making the icing for The Big Blue One's extremely fulsome cake.'

This is all quite stunning, but so what? Then I thought: 'Billions of dollars' just sounds like a hell of a lot of money when you say it out loud. Consider it in terms of an equivalent, such as seconds of life, and you realise just *how* much of a hell of a lot it really is.

If, therefore, IBM can make that much money out of the computer business, why are so many other companies going under?

There are, of course, significant reasons why IBM is such a success. It started by being in the right place at the right time when the computer industry first took off. It pursued its sales and marketing objectives with a zeal that still borders on religious mania. It became *the* name in computers: for many people computing means IBM, and that includes other computer manufacturers.

But why has it succeeded while others have failed? One possible reason for such success was recently brought to my attention. I visited a software company that had done well out of addressing a vertical slice of the software market place, and was due to launch its latest product. Its target was the legal profession, a business well-known — in folklore if not always in fact — to be one of the most remunerative ways of earning a living.

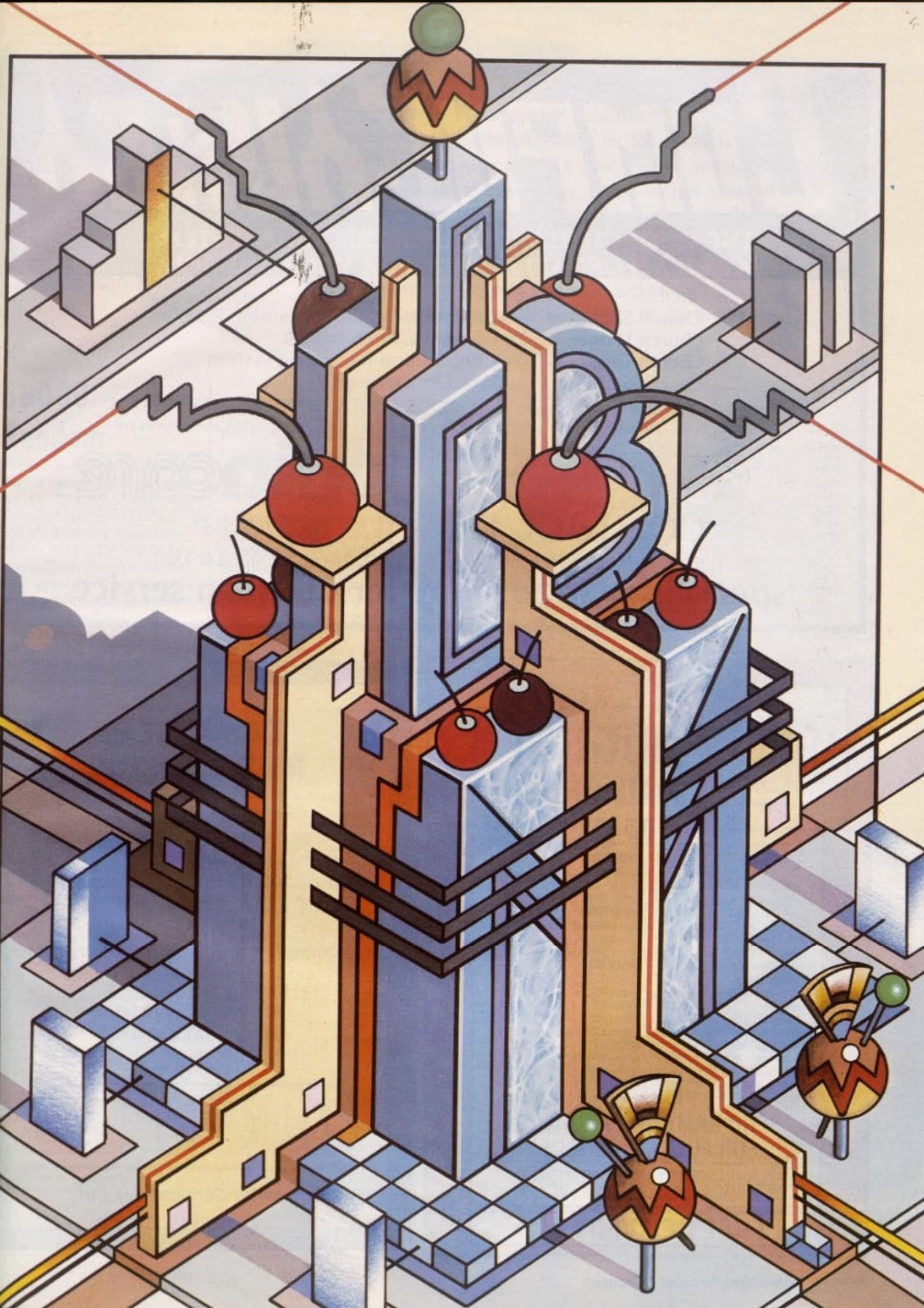
The package was introduced and explained, and the price was mentioned in passing; at which point I felt the urge

It was then that the thought struck me. I've seen several software product catalogues from distributors and individual product announcements from software companies that reveal a great divide in the software business. Place your company in a nicely defined vertical market and you can charge what you like for the product. If the punters want it, they'll beat a path to your door, no matter what the price.

If, however, your product is of a more general nature with potential applicability across a wide range of user sectors, then the price must be low, competitive and aggressive. The related logic is quite straightforward: general-purpose applications packages will theoretically be sellable to a wide range of customers across a wide range of user sectors.

There is, therefore, the potential for high volume sales which justify an aggressive price. Such a price will also be needed to generate sales in the first place, because other software companies will be fighting for the same general-purpose data processing markets. They will all be selling word processors, database managers, spreadsheets *et al.* What will primarily distinguish the various packages will be price, unless the features of one are so stupendous as to be unbelievable, or so appalling as to be laughable.

Even the prices will be broadly similar,



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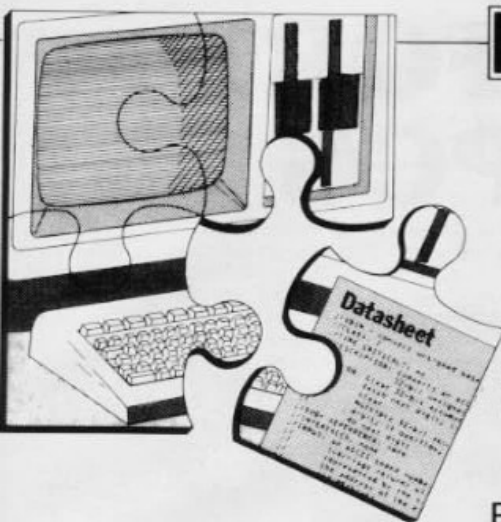
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68000 Random

SubSet is making a big leap from 8-bit to 32-bit processing with RNDW (Datasheet 1) from Matthew Rhodes. RNDW uses the algorithm $R(i+1) = (1509 \cdot R(i) + 41) \bmod 2^{16}$, thought to produce good 16-bit pseudo-random numbers. Matthew also submitted a 32-bit generator using $R(i+1) = (69069 \cdot R(i) + 41) \bmod 2^{32}$ which will be given in the February issue.

Matthew was unable to test the routines and as I don't own a Macintosh, I would be glad to hear if RNDW does work satisfactorily.

Two listings are provided in the RNDW Datasheet. These show the code that ought to be generated by an assembler for a SEED within or outside the range of 'base page' memory. They also demonstrate alternative methods of adding immediate data to a data register.

DATASHEET 1

```
=====
: RNDW      16-bit pseudo-random number generator.
:=====
: JOB       To generate a 16-bit random number from the
:           series:  $R_{i+1} = (R_i \cdot 1509 + 41) \bmod 2^{16}$ .
: ACTION    Read previous random number from store.
:           Multiply by 1509 and add 41.
:           Write low order word of product to number store.
:=====
: CPU       MC68000 series.
: HARDWARE  Two bytes of RAM for random variable (must be
:           located between $FFB000 to $007FFF inclusive for
:           "absolute short" address version, RNDWAS).
: SOFTWARE  None.
:=====
: INPUT     16-bit seed or previous random number must be in
:           RAM variable SEEDS or SEEDL.
: OUTPUT    New random number in SEEDS or SEEDL.
:           DO low word = new random number.
:           DO high word holds multiplication high result.
:           Negative (N) and Zero (Z) flags show the status.
:           Overflow (V) and Carry (C) flags are cleared.
: ERRORS    Re-entrancy could cause numbers in the sequence
:           to be missed, affecting the randomness.
:           DO CCR
: REG USE   None.
: STACK USE None.
: RAM USE   None.
: LENGTH    18 (RNDWAS), 22 (RNDWAL).
: CYCLES    68000: 108 (RNDWAS), 116 (RNDWAL).
:           68008: 160 (RNDWAS), 180 (RNDWAL).
:           68010: Max. 92 (RNDWAS), Max. 100 (RNDWAL).
:=====
: CLASS 2   -discreet *interruptable *promable
: -*-*-     -reentrant *relocatable -robust
:=====
: ...Code generated by assembler when "SEED" is located at
: ...an address between $FFB000 and $007FFF (inclusive).
```

```
SEEDS EQU    $a1a0    ;Address of 2-byte random number.
:
RNDWAS MOVE.W SEEDS,D0 ;Get old number or seed into      303B
:Data register 0, low word.      a1a0
MULU    #1509,D0 ;Multiply it by 509 with      C0FC
:product in all D0.      05E5
ADD.W    #41,D0 ;Add 41 to low word only,      D07C
: this is modulo 2**16.      0029
MOVE.W    D0,SEEDS ;Store new number (in low word      31C0
:D0) back to variable.      a1a0
RTS                          ;Exit, number formed.      4E75
:
: ...Code generated by assembler when "SEEDL" is located at
: ...an address between $008000 and $FF7FFF (inclusive).
: ...("ADDI" is an alternative to "ADD" for adding immediate
: ...data into a Data register.)
SEEDL EQU    $a2a1a0 ;Address of 2-byte random number.
:
RNDWAL MOVE.W SEEDL,D0 ;Get old random number or      3039
:seed into lowest word of      00a2
:Data register 0 (D0\3).      a1a0
MULU    #1509,D0 ;16-bit by 16-bit multiply;      C0FC
:D0\6 = D0\3 * $05E5.      05E5
ADDI.W    #41,D0 ;16-bit addition;      0640
:D0\3 = D0\3 + $0029.      0029
MOVE.W    D0,SEEDL ;Copy new random number from      33C0
:D0\3 to random variable,      00a2
:affecting N, Z, V and C flags. a1a0
RTS                          ;Exit, number in SEEDL & D0\3. 4E75
:=====
```

6502 n-base conversion

XBIN by Dennis May converts an unsigned (positive or absolute) number of any base from 2 to 36 into a 32-bit binary value.

The input number is a string of ASCII digits and upper-case letters ending with a \$OD (carriage return) terminator. The unsigned binary result is output in four consecutive page zero bytes.

DATASHEET 2

```
=====
: XBIN      Unsigned ASCII base 2-36 to 32-bit conversion.
:=====
: JOB       To convert an unsigned number, of any base 2 to
:           36, held in memory as ASCII digits and upper
:           case letters to an 32-bit binary number held in
:           registers or base-page "pseudo-registers".
: ACTION    Clear result.
:           Get first character.
:           ON overflows [ Set overflow flag & exit. ]
:           WHILE character NOT terminator:
:           [ Convert character to binary coded digit.
:             Result = result * base + digit.
:             Index and get next character. ]
:           Set conversion completed flag.
:=====
```


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```

:CPU      6502
:HARDWARE Memory containing ASCII number string.
:SOFTWARE None.
-----
:INPUT    M4,5 addresses 1st byte of ASCII string which
           must terminate with $0D (carriage return).
           M6 contains the number base.
:OUTPUT   Registers changed. M7 to MC changed.
           M4 to M6 not changed.
           C = 0: conversion completed.
           32-bit result in M0 to M3 (M3 is high order).
           C = 1: overflow during process.
           M0 to M3 is indeterminate.
:ERRORS   No test is made for non-upper-case alphanumeric
           characters in ASCII string.
           No test is made for digits greater than base.
:REG USE  P A X Y
:STACK USE 2
:RAM USE   M0 to MC
:LENGTH   106
:CYCLES    Not given.
-----
:CLASS 2  -discreet *interruptable *promable
:***--    *entrant -relocatable -robust
-----
:
ASCN = M4      :Stored address of ASCII string.
BASE = M6      :Stored ASCII number base (2 to 36).
BTMP = MB      :Storage for working BASE.
RSLT = M0      :4-byte result location (low byte).
RTMP = M7      :Storage for working RSLT (low byte).
INDX = MC      :Storage for ASCII string pointer.
:
XBIN LDY #0     :Clear for RSLT clear.           A0 00
      LDX #4     :Index for RSLT 4 bytes.         A2 04
:
XBIN1 DEX        :Index RSLT next byte           CA
      STY RSLT,X :and clear it, repeat           94 M0
      BNE XBIN1  :until RSLT clear. X = 0.       D0 FB
      STX INDX   :Initialise ASCII index to 0.   B6 MC
:
XBIN2 LDY INDX   :Index current ASCII byte       A4 MC
      LDA (ASCN),Y :and pick it up.              B1 M4
      CMP #0D     :If ASCII "carriage return"    C9 0D
      BEQ END     :terminator then completed.    F0 52
:
      SEC        :Strip ASCII digits high        38
      SBC #30     :nibble and test for if        E9 30
      CMP #0A     :greater than digit 9,         C9 0A
      BCC ASCY    :adjusting for gap between     90 02
      SBC #7      :"9" and "A" if it is.         E9 07
ASCY PHA         :Save new digit.                48
      LDA #0      :Clear for RTMP clear.         A9 00
      LDX #4      :Index for RTMP 4 bytes.       A2 04
:
XBIN3 DEX        :Index RTMP next byte           CA
      STA RTMP,X  :and clear it, repeat         95 M7
      BNE XBIN3  :until RTMP clear.             D0 FB
:
      LDA BASE    :Move base to temp byte for    A5 M6
      STA BTMP    :use as multiplier.           B5 MB
      LDY #8      :Count for 8-bit multiplier.   A0 08
:
XBIN4 ASL BTMP    :Shift next multiplier bit      06 MB
      PHP        :into C and save it.           08
      ASL RTMP    :Shift left partial product    06 M7
      ROL RTMP+1  :for possible addition at      26 MB
      ROL RTMP+2  :next bit place.              26 M9
      ROL RTMP+3  :                             26 MA
      BCS OVFM1   :Skip out if product too big.  B0 2E
      PLP        :Get multiplier bit to C and    28
      BCC XBIN6   :skip if 0, no add this place. 90 0E
      LDX #4      :Else index from low bytes.   A2 FC
      CLC        :Clear for low bytes add.       18
:
XBIN5 LDA RSLT+4,X :Add multiplicand byte to      B5 M4
      ADC RTMP+4,X :partial product.            75 MB
      STA RTMP+4,X :                             95 MB
      INX          :Index next and repeat for    E8
      BNE XBIN5    :all four bytes.             D0 F7
      BCS OVFM2    :Out if product too big.      B0 1E
:
XBIN6 DEY         :Repeat for all 8 bits of      88
      BNE XBIN4    :multiplier (base).          D0 DF
:
      CLC         :Clear for add.                18
      PLA         :Get new digit and add to      68

```

```

ADC RTMP          :product low byte, result to    65 M7
STA RSLT          :partial conversion result.    85 M0
LDX #3            :index from byte 2.            A2 FD
:
XBIN7 LDA RTMP+4,X :Move other three product     B5 MB
      ADC #0        :bytes to conversion result  69 00
      STA RSLT+4,X  :adding in any carry from    95 M4
      INX           :digit add in to low byte and E8
      BNE XBIN7     :subsequent carries.         D0 F7
      BCS OVFM3     :Out if result too big.      B0 09
:
      INC INDX      :Index next ASCII byte and   E6 MC
      JMP XBIN2     :continue conversion.        4C 10 hi
:
END CLC           :Flag conversion complete      18
      RTS           : (C = 0) and exit.          60
:
OVFM1 PLA         :Lose multiplier bit.          68
OVFM2 PLA         :Lose digit.                  68
OVFM3 RTS         :Exit (C = 1) on overflow.     60
:*****

```

68000 notation

The symbolic 'lohi' and 'hilo' used for 16-bit absolute addresses in Z80, 6502 and 6809 datasheet listings are inadequate for the 68000 with its 24-bit addresses. Instead, 'a2a1a0' signify the 3-byte addresses with 'a0' as the low order byte. Note that the 68000 requires the unused 'a3' to be in the code.

68000 Data and Address registers, Stack Pointers and Program Counters are all four bytes long. Much processing, particularly that dealing with ASCII characters, will use various combinations of individual bytes within registers and description of what is happening could be very complex.

For descriptive purposes,

the position of the bytes within any register can be coded as a sequence of four bits with set bits indicating which register-bytes are currently being referred to. The code can be written as a single hexadecimal digit after the register name. This notation has been used in the comments to RNDWAL where the lowest two bytes of data register 0 are referred to as D0\3.

Here are two other examples of how the notation works: (1) the processor addresses program instructions using PC\7 (lowest three bytes of the Program Counter); (2) 'SWAP D4' can be described as D4\C exchanged with D4\3, but if we are using only the lowest byte of each word then it could be commented as 'exchange D4\4 with D4\1'.

Random bits VIA the 6522

RND16B (Datasheet 3) from T Browning is a 6502 equivalent of an idea put to me some time ago that a 7-bit random value could be read from the Z80 Refresh register, but with extra processing. It uses the two 16-

bit counters of the 6522 VIA to compute 16 'random' bits.

Registers which increment or decrement in synchronisation with the system clock cannot be relied upon to give random values if read inside a loop. However, RND16B is a very fast method of getting a 'non-calculated' value.

DATASHEET 3

```

:*****
: RND16B Compute 16 random bits.
:*****

```



```

:JOB      To compute 16 random bits using a hardware timer
:         device with two independent 16-bit counters.
:ACTION   Set counters to decrement continuously without
:         interrupt.
:         Read contents of timer 2 into registers.
:         Exclusive-or hi-byte with lo-byte of timer 1.
:         Exclusive-or lo-byte with hi-byte of timer 1.
:         Write contents of registers to timer 2.
-----
:CPU      6502
:HARDWARE 6522 Versatile Interface Adapter (VIA).
:SOFTWARE None.
-----
:INPUT    None.
:OUTPUT   A,Y contains an unknown (random) number.
:         Sign and zero flags show status of byte in A.
:         VIA counters are free-running.
:         VIA port input latches are disabled.
:         The randomness of the result depends entirely on
:         the regularity with which RND16B is called.
:ERRORS
:         A Y P
:STACK USE None.
:RAM USE  None.
:LENGTH  25
:CYCLES   38
-----
:CLASS 2  -discreet *interruptable *promable
:         *reentrant *relocatable -robust
-----
:
RND16B LDA #0      :Clear VIA ACR putting timers      A9 00
STA ACR           :in one-shot mode.                 8D 10 hi
LDA T2C-L         :Exclusive-or lo-bytes with         AD 10 hi
EOR T1C-L         :hi-bytes of other counter          4D 10 hi
TAY               :with Y as low byte result           A8
LDA T2C-H         :and A as high byte result.          AD 10 hi
EOR T1C-L         :                                     4D 10 hi
STY T2C-L         :Write result into counter of       8C 10 hi
STA T2C-H         :timer 2, letting it decrement.     8D 10 hi
RTS               :Exit, random bits in AY.           60
-----

```

68000 challenge

The 68000 has both signed and unsigned 32-bit by 16-bit division with 16-bit quotient and 16-bit remainder. Division by zero and overflow are 'trapped' and the machine goes into Supervisor mode for 'except-

tion processing'.

Worst-case division of a 32-bit number can give either a 32-bit quotient or a 32-bit remainder — the DIVS and DIVU instructions are possibly only worth using for 16-bit division.

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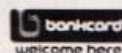
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Please do not hesitate to call us and confirm the latest prices, and we will do our best to better any genuine price quoted by our competitors.

SOFTWARE AND HARDWARE DISCOUNT WAREHOUSE MAILWARE

PROGRAMS

APC is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation, and a listing on plain white paper — typed if you have no printer.

Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.

All programs should be fully debugged and your own original, unpublished work.

We prefer to receive programs which adhere to the following criteria:

1 Maximum 80-column width; and

2 Emphasised typeface.

Please keep a copy of everything.

Programs are paid for at the rate of \$20 per page of published listing.

Send your contributions to APC Programs, 77 Glenhuntly Road, Elwood, Victoria 3184.

Dragon/Tandy Color owners who have created an adventure party with 'Brimstone Part One' published last month can now explore their first dungeon with 'Brimstone Part Two'. This advanced Dungeons and Dragons-type program, although lacking the polished finish of commercial programs, has great puzzle quality and game depth. Next month there'll be another scenario —

'The Tavern' — and details on how to create your own dungeons.

'Defkeys' for the Commodore 64 allows the function keys to be defined to any string, and there's 'Golf' for the Spectrum. 'Rudiments of Raster Interrupts' for the '64, a useful 'sort at' input for the TRS-80 (which is general enough to be easily converted for other machines) and more in the first 'Programs' listing for 1985.



Games



Scientific/mathematic



Business



Toolkit/utilities



Educational/Computer Aided Learning



Brimstone Part Two

by Paul Gallagher

To play 'Brimstone Part Two' you'll need some adventure characters created with 'Brimstone Part One', which was published in last month's APC. Having equipped yourself with a character or an adventure party of up to four characters, you can now begin your first scenario — The Dungeon.

The rules should be familiar to Advanced Dungeons and Dragons players as the game follows AD&D's format; non

AD&D players needn't worry as full instructions are included and the program uses simple menu selections. As in the role-playing games, you have to make any maps you feel are necessary.

The rooms are contained in a data block, thus permitting new dungeons to be readily created by other dungeon 'masters'. The dungeon in this program has 75 rooms and corridors on seven floor levels. There's an option to save the

game at any room position providing you are not involved in combat, but if you wish to progress to part three, The Tavern, you must save the game at the exit (room one).

The program runs in over 30k, so before loading, the following command must be entered:

POKE 25,6:NEW

```
10 'BRIMSTONE PART II: copyright P.Gallagher 1984
20 CLEAR700: DIM TF$(66),M$(80):CLS:PRINT"NEW GAME OR CURRENT ADVENTURE.":GOSUB40
30 IFK$="C"THEN GOSUB3180ELSE GOSUB3250
40 L=1:R=75:O=96:P=107:M=1288:FORX=1TOXX:FORY=1TOY:SV$(X,Y)=S$(X,Y):NEXTY:LP=LP+
L(X):NEXTX:LP=LP/XX:GOSUB3340:GOSUB3740:GOSUB3870:GOTO270
40 KS=INKEY$:IFK$=""THEN40ELSE RETURN
50 FORK=1TO2000:NEXT:RETURN
60 FORC=1770241STEP32:PRINT@C,STRING$(15,32):NEXT:RETURN
70 FORC=26870448STEP32:PRINT@C,STRING$(32,32):NEXT:PRINT@480,STRING$(31,32):RE
TURN
80 PRINT@416,"":INPUTN$:FORX=1TOXX:IFN$=M$(X)THENRETURNELSENEXT
90 PRINT@448,N$:" IS NOT WITH YOUR PARTY.":GOSUB50:PRINT@448,"":GOTO80
100 X1=1024+(INT((8-YR)/2)*32+INT((16-YR)/2)):X2=X1+XR:X3=X1+YR+32
110 CLS:FORX=X1 TOX2:POKEX,191:POKE(X+YR+32),191:NEXT:FORX=X1 TOX3:STEP32:POKE
X,191:POKE(X+XR),191:NEXT
120 XN=X1+INT(XR/2):IFDN=0THENPOKEN,255:POKE(XN+1),255
130 XS=X3+INT(XR/2):IFDS=0THENPOKES,175:POKE(XS+1),175
```


PROGRAMS

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140 KW=X1+(INT(YR/2))*32:IFD=0 THEN POKE XW,239
150 XE=XW+XR:IFDE=0 THEN POKE XE,128
160 IFDU=0 THEN POKE(X1+33),150
170 IFDU=0 THEN POKE(X1+33),214
180 IFLC=1 THEN M=X1+65:LC=0
190 IFRN=1 THEN POKE X5,0:POKE(X5+1),0:DS=0
200 GOSUB 60:PRINT@20,"LEVEL":L:PRINT@50,"ROOM":XR:"*"/YR:PRINT@83,"CONTENTS":
PRINT@115,F@2:PRINT@147,F@3:PRINT@179,F@4:
210 IFLF=1 ORR=6 ORR=PR THEN 250
220 IFR=R2 THEN GOSUB 1670:GOTO 250
230 RS=RND(6):IFR=1 THEN RS=1
240 IFRS=3 THEN GOSUB 1640
250 PRINT@288,"ACTION OPTIONS:--":PRINT@680,"WEAPONS READIED.":PRINT@PARTY STATUS. CAR
RIED TREASURE.":PRINT@EXPLORE ROOM.
260 PRINT@DOORS(SECRET) & TRAPS(HIDDEN).":PRINT@SAVE ADVENTURE.":PRINT@480,"LOCK
ED DOORS:PICK OR FORCE.":RETURN
270 R=1:GOSUB 3340:GOSUB 100
280 FORZZ=1 TO 25 STEP 5:W=M:POKE M,P
290 RS=RND(6):KS=INKEY$:IFKS="" THEN 290
300 IFKS="W" THEN GOSUB 1030
310 IFKS="P" THEN GOSUB 2240
320 IFKS="E" THEN GOSUB 1070
330 IFKS="D" THEN GOSUB 1530
340 IFKS="L" THEN GOSUB 870
350 IFKS="C" THEN GOSUB 2270
360 IFKS="S" THEN GOSUB 3100
370 IFKS="Y" THEN M=M-32
380 IFKS="U" THEN M=M-31
390 IFKS="J" THEN M=M+1
400 IFKS="M" THEN M=M+33
410 IFKS="N" THEN M=M+32
420 IFKS="B" THEN M=M+31
430 IFKS="G" THEN M=M-1
440 IFKS="T" THEN M=M-33
450 IFFT=0 AND M=FT OR M=FT+10 OR M=FT+32 OR M=FT+33 THEN GOSUB 980
460 P1=PEEK(M)
470 P1=PEEK(M):IFP1=191 THEN M=M:GOTO 570
480 POKE W,D:IFOL=1 THEN RS=1
490 IFP1=255 THEN GOSUB 630
500 IFP1=175 THEN GOSUB 670
510 IFP1=239 THEN GOSUB 710
520 IFP1=128 THEN GOSUB 750
530 IFP1=150 OR P1=214 THEN GOSUB 790
540 IFP1=19 THEN GOSUB 810
550 IFP1=159 THEN GOSUB 940
560 IN=IN+1:IFIN>100 THEN GOSUB 580
570 NEXTZZ
580 FORX=X1+33 TO X3-31 STEP 32:FORY=Y1 TO Y3-2:POKE X,128:NEXTY,X
590 IN=0:GOSUB 40:IFKS="" THEN 590
600 CL=0:LM=0:S=S+1:IFS=0 THEN FORX=1 TO X3:FORY=1 TO Y3:SV@X,Y)=SV@X,Y):NEXTY,X:S=0
610 IFLI=1 THEN FORX=1 TO X3:FORY=1 TO Y3:TX@X,Y)=TX@X,Y):NEXTY,X:PRINT@YOU MANAGE TO FIGHT
YOUR WAY BACK TO THE ENTRANCE BUT LOSE MOST OF YOUR TREASURE IN THE DARK.
GOSUB 40:R=1:GOSUB 3340:GOSUB 100:RETURN
620 CLS:LI=LI-1:PRINT@230,LI:TORCHES LEFT:PRINT@INC.LANTERNS:OIL=10 TORCHES
GOSUB 40:LF=1:GOSUB 100:RETURN
630 IFPN=R OR OL=1 THEN 650
640 MF=0:IFRS>30 OR LN=1 THEN LN=1:PN=0:GOTO 660
650 PR=R:PS=DN:R=DN:GOSUB 3340
660 GOSUB 100:IFM=1160 THEN RETURN ELSE M=X5-32:RETURN
670 IFPS=R OR OL=1 THEN 690
680 MF=0:IFRS>30 OR LS=1 THEN LS=1:PS=0:GOTO 660
690 PR=R:PN=DS:R=DS:GOSUB 3340
700 GOSUB 100:IFM=1160 THEN RETURN ELSE M=XN+32:RETURN
710 IFPN=R OR OL=1 THEN 730
720 MF=0:IFRS>30 OR LW=1 THEN LW=1:PN=0:GOTO 660
730 PR=R:PE=DN:R=DN:GOSUB 3340
740 GOSUB 100:IFM=1160 THEN RETURN ELSE M=XE-1:RETURN
750 IFPE=R OR OL=1 THEN 770
760 MF=0:IFRS>30 OR LE=1 THEN LE=1:PE=0:GOTO 660
770 PR=R:PN=DE:R=DE:GOSUB 3340
780 GOSUB 100:IFM=1600 THEN RETURN ELSE M=XN+1:RETURN
790 LR=STR$(DU):LS=MID$(LR,2,1):R=MID$(LR,3):L=VAL$(LS):R=VAL$(R):LC=1
800 GOSUB 3340:GOSUB 100:RETURN
810 PR=R:IFSD=XN THEN GOSUB 3340:GOSUB 100:M=X5-32
820 IFSD=X5 THEN GOSUB 3340:GOSUB 100:M=XN+32
830 IFSD=XN THEN GOSUB 3340:GOSUB 100:M=XE-1
840 IFSD=XE THEN GOSUB 3340:GOSUB 100:M=XN+1
850 RETURN
860 M=M:GOSUB 70:PRINT@389,"*** DOOR LOCKED ***":RETURN
870 GOSUB 70:P1=PEEK(M-32):P2=PEEK(M+32):P3=PEEK(M-1):P4=PEEK(M+1):IF(P1=191 OR P1=
96 AND P2=191 OR P2=96 AND P3=191 OR P3=96 AND P4=191 OR P4=96) THEN PRINT@320,"WHICH DO
OR YOU ARE NOT STANDING NEAR A DOOR.":GOSUB 40:RETURN
880 GOSUB 70:PRINT@323,"WHO WILL TACKLE THE DOOR?":GOSUB 80
890 IFCK(X)=1 THEN 910
900 IF OL=1 THEN GOSUB 70:PRINT@353,"HPS YOUR THIEF GOT SUCH A LOW INTELLIGENCE
THAT HE DOESN'T REALISE WHEN HE'S FAILED !!!!!":RETURN
910 IFCK(X)=1 THEN OL=21+LC(X)+4:IFRS(X)=1 THEN OL=OL+10
920 IFCK(X)=1 THEN ANDR(X)=1 THEN OL=OL+5
930 RP=RND(100):IF CK(X)=1 THEN ANDR(X)=1 THEN PRINT@YOUR THIEF IS UNSUCCESSFUL.
NO FURTHER ATTEMPTS ALLOWED!":OL=1:RETURN
940 IFCK(X)=1 THEN ANDR(X)=1 THEN PRINT@YOUR THIEF IS SUCCESSFUL !*:OL=1:RETU
RN
950 IFOL=2 THEN GOSUB 70:PRINT@320,"YOUR FIGHTERS ARE UNABLE TO MOVETHE VERY SOLID
DOOR !!!!!":RETURN
960 IFS(X)=1 OR VAL$(B@X))>RND(100) THEN PRINT@YOUR FIGHTER SMASHES THE DOO
R OPEN.....":OL=1:RETURN
970 PRINT@UNSUCCESSFUL-DOOR TOO SOLID!":OL=2:RETURN
980 GOSUB 70:PRINT@288,"A TRAP DOOR OPENS IN THE FLOOR- THE WHOLE PARTY FALL THRO
UGH...
990 FORX=1 TO X3:IFH(X)=1 THEN 1020 ELSE D=INT(9*RND(6)):C(X)=C(X)+D(X):IFH(X)=0 C(X)
HEND=H(X)+1
1000 FORY=1 TO Y3:IFT(X,Y)=TF(53) THEN D=0:NEXTY
1010 H(X)=H(X)+D:PRINT@H(X):SUFFERS(D):HP DAMAGE"
1020 NEXTX:R=TR:L=L+1:GOSUB 40:GOSUB 3340:GOSUB 100:RETURN
1030 GOSUB 70:PRINT@288,"PREPARE WEAPONS FOR --":FORX=1 TO X3
1040 PRINT@448,"":PRINT@320+X32,N@X(X):INPUTW@X(X)
1050 IFW@X(X)=41@X(X) OR W@X(X)=42@X(X) OR W@X(X)=43@X(X) THEN 1060 ELSE PRINT@448,N@X(X):DOE
S NOT HAVE A "/W@X(X):GOSUB 50:GOTO 1040
1060 NEXTX:WD=L:GOSUB 250:RETURN
1070 IFFR=1 THEN GOSUB 70:PRINT@320,"YOU HAVE ALREADY SEARCHED THIS ROOM. YOUR CO
NTINUED EXAMINATION REVEALS NOTHING MORE.":GOSUB 40:RETURN

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PROGRAMS

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1000 FF=R:GOSUB70:PRINT320,"WHO IS SEARCHING?":GOSUB80:RP=RND(100)
1010 IFRP>100:GOTO1100:IFRP<10:GOTO1100:PRINT2450,"** NOTHING OF VALUE FOUND **":GOSUB50:RETURN
1100 GOSUB1100:GOSUB70:FORZZ=1TO2STEP0
1110 GOSUB70:PRINT2280,"TAKE. DETECT MAGIC. DROP ITEM.":PRINT320,"AGREE TO LEAVE ROOM.":GOSUB40:K1$=K$
1120 IFK$="T"ANDAT=0THENGOSUB1240
1130 IFK$="T"ANDAT=1THENPRINT422,"*ALREADY TAKEN*":GOSUB50
1140 IFK$="M"THENGOSUB1320
1150 IFK$="D"THENGOSUB1370
1160 IFK$="R"THENRETURN
1170 NEXTZZ
1180 G=0:T=0:F(0)=0:F(1)=0:T$="" RT=RND(20):GOSUB70:IFRT>10THENG=RT*7:PRINT320,"YOU HAVE UNCOVERED A LEATHER BAGCONTAINING.....":G:GP:GOSUB40:F(0)=GOLD:F(0)=G:RETURN
1190 IFRT>3THENG=RT*10:PRINT320,"YOU'VE FOUND A CACHE OF":RT:"GEMS WORTH 50GP EACH PLUS":G:"GOLD COINS.":G=RT*50+G:GOSUB40:F(0)=GOLD:F(0)=G:RETURN
1200 T=RND(3+L*9):T$=LEFT$(T$,9)
1210 PRINT320,"A GOOD FIND.....YOU'VE DISCOVERED":IFT$<>"CHAINMAIL"ORT$<>"PLATE MAIL"THENPRINT"A "
1220 IFT$<T$<"GOLDEN CROWN"ORLEFT$(T$,2)=$"SC"THENPRINTT$<T$ELSEPRINTT$
1230 GOSUB40:RETURN
1240 GOSUB70:PRINT320,"WHICH ITEM DO YOU INTEND TAKING" GOSUB40:F(1)=T$:RP=RND(100):F(2)=200+RP:F(3)=900+RP:F(4)=100+RP
1250 FORZ=0TO4:IFK$=LEFT$(F$(Z),1)THEN1270ELSENEXTZ
1260 PRINT"THAT ITEM IS NOT HERE !!!":GOSUB50:RETURN
1270 PRINT"WHO WILL CARRY THE ":F$(Z):GOSUB80
1280 IFUE(X)<F(Z)THENPRINT"IT'S TOO HEAVY FOR ":N$:".....OVERLOADED?":GOSUB50:RETURNELSEIFK$="G"THEN1310
1290 FORY=1TO5:IFT$(X,Y)=$"ANDZ=1THENT$(X,Y)=T$(X,Y):GOTO1310
1300 NEXTY:PRINT448,N$:" IS CARRYING TOO MANY ITEMS TO MANAGE ANYMORE.":GOSUB50:RETURN
1310 PRINTN$:" TAKES THE ":F$(Z):GOSUB50:WE(X)=WE(X)-F(Z):G(X)=G(X)+F(0):AT=1:RETURN
1320 DN=0:GOSUB70:PRINT320,"WHO CASTS THE SPELL?":GOSUB80
1330 FORY=1TO5:IFS$(X,Y)=$"DETECT MAGIC"THEN1350ELSENEXT
1340 PRINT"YOU DO NOT HAVE DETECT MAGIC!":GOSUB50:RETURN
1350 PRINT352,"WHAT ITEM DO YOU CAST IT ON?":GOSUB40:IFK$=LEFT$(T$,1)THENPRINT352,"THE ITEM GLOWS.....YOU HOLD A ":T$(T):GOSUB40:DN=1:RETURN
1360 GOSUB70:PRINT358,"***NOTHING HAPPENS**":GOSUB50:RETURN
1370 GOSUB70:PRINT328,"WHICH ITEM ARE YOU DISCARDING?":GOSUB40
1380 IFK$="G"THEN1410
1390 FORX=1TO5:FORY=1TO5:IFK$=LEFT$(T$(X,Y),1)ORX$=LEFT$(F$(X,Y),1)THEN1520ELSENEXT Y,X
1400 PRINT352,"NO-ONE IN YOUR PARTY APPEARS TO HAVE THIS OBJECT.":GOSUB50:RETURN
1410 PRINT320,"WHO IS DISCARDING GOLD?":GOSUB80
1420 PRINT352,"DO YOU WISH TO GIVE THE GOLD TO SOME-ONE ELSE OR LEAVE IT IN THE ROOM.":GOSUB40
1430 IFK$="G"ORX$="L"THENPRINT"HOW MUCH?":INPUTG ELSE1420
1440 IFG>G(X):THENPRINT448,"THIS IS MORE THAN YOU HAVE FOUND":GOSUB50:RETURN
1450 IFK$="G"THENPRINT448,"WHO TO?":INPUTN$ELSE GOTO1500
1460 FORY=1TO5:IFN$=N$(Y)THEN1480ELSENEXT
1470 PRINTN$:" IS NOT IN YOUR PARTY":GOSUB50:RETURN
1480 IFG>WE(Y)THENPRINT"THIS IS MORE THAN":N$(Y):"CAN CARRY":GOSUB50:RETURN
1490 G(X)=G(X)-G:WE(X)=WE(X)+G:G(Y)=G(Y)+G:WE(Y)=WE(Y)-G:PRINT448,"TRANSACTION COMPLETED.":GOSUB50:RETURN
1500 IFK$="L"THEN G(X)=G(X)-G:WE(X)=WE(X)+G:PRINT448,"THE GOLD VANISHES ON SCATTERING ACROSS THE FLOOR.":GOSUB50:RETURN
1510 PRINT"HUH!":GOSUB50:RETURN
1520 RP=RND(XX):F(3)=T$(X,Y):PRINT384,"O.K.":N$(RP):" PUTS THE ":F$(Y):" ONTO THE FLOOR.":GOSUB50:F(3)=0:T$(X,Y)=$"":RETURN
1530 Z=0:GOSUB70
1540 FORX=1TO5:IFR$(X)=$"ELF"THENZ=Z+1
1550 NEXT X:RS=RND(6+2*Z/3)
1560 IFFT>0ANDRS>5THENPRINT356,"***FLOOR TRAP DETECTED***":POKEFT,159:POKE(FT+1),159:POKE(FT+32),159:POKE(FT+33),159:GOSUB40:RETURN
1570 P1=PEEK(M-32):P2=PEEK(M+32):P3=PEEK(M-1):P4=PEEK(M+1):IFP1+96ANDP2=96ANDP3=96ANDP4=96THENPRINT352,"THERE ARE NO SECRET TRAP-DOORS DETECTED HERE.":GOSUB40:RETURN
1580 SD=M-32:IFSD=0ANDON<0ANDRS>5.5THENPOKESD,19:R=-1:DN:GOTO1630
1590 SD=M+32:IFSD=0ANDON<0ANDRS>5.5THENPOKESD,19:R=-1:DS:GOTO1630
1600 SD=M-1:IFSD=0ANDON<0ANDRS>5.5THENPOKESD,19:R=-1:DW:GOTO1630
1610 SD=M+1:IFSD=0ANDON<0ANDRS>5.5THENPOKESD,19:R=-1:DE:GOTO1630
1620 PRINT448,"NOTHING SENSED OR DETECTED.":GOSUB40:GOSUB250:RETURN
1630 PRINT448,"SECRET DOOR DISCOVERED.....":RETURN
1640 MM=RND(10+10*L):IFL>2THENMM=INT(MM*LOG(L)):IFMM>80THEN1640
1650 MF=0:MM=RND(20+2):IFMM>70THENMM=1
1660 IFMM>40ANDMM<51THENMM=1
1670 IFMF=1THENMM=M1:MM=M2
1680 M1=0:L1=MF=0:FORY=1TO5:MP(Y)=RND(MF):HE=HE+MP(Y):IFL>2THENMP(Y)=INT(MP(Y)*LOG(L))
1690 NEXT Y:M1=MM:M2=L:IFL>2THENM2=INT(L*LOG(L))
1700 HE=(0.7*ND(3+15)*MM+HE)*ND(X)/L
1710 IFMM=0THENMM=1
1720 GOSUB70:PRINT320,"you are attacked by -":PRINTMM:" (":N$(MM)
1730 PRINT415,"FIGHT COMMUNICATE RUN":GOSUB40:K1$=K$
1740 IFK$="R"THEN MF=1:M1=MM:M2=MM:R2=R:R=RP:GOSUB3340:GOSUB100:M=1160:W=1160:RETURN
1750 IFK$="C"ANDMM<6THENGOSUB1790:RETURN
1760 IFK$="C"ANDMM>5THENPRINT"THEY IGNORE YOUR SPEECH & ATTACK":GOSUB50:GOSUB1890:RETURN
1770 IFK$="F"THENGOSUB1890:RETURN
1780 IFK$="G"THENGOSUB100:RETURNELSEGOTO1730
1790 GOSUB70:PRINT320,"WHO ATTEMPTS TO COMMUNICATE" GOSUB80
1800 IFRND(100)>100:GOTO1810:IFRND(100)>100:GOTO1810:PRINT"THEY'RE NOT INTERESTED-attack":GOSUB50:GOSUB1890:RETURN
1810 GOSUB70:FL=0:PRINT2280,"THE ":N$(MM):" RECOGNISE YOUR":PRINT"FRIENDLY GESTURES AND YOUR / SUPERIOR STRENGTH !"
1820 RS=RND(4+RND(4)):IFRS>5THENPRINT"THEY TELL YOU OF A LEGEND OF A POWERFUL GOLDEN CROWN AND SEVEN MAGICAL GEMS SCATTERED & LOST IN THE DEPTHS BELOW!!!"
1830 IFRS>7THENPRINT"THEY TELL YOU THERE IS A HIDDEN REAR EXIT WHICH THEY'VE HEARD OFFROM AN OLD HOBGOBLIN !!!"
1840 IFRS>6THENPRINT"THE ":N$(MM):" CONFIDE" PRINT"IN YOU THAT THEY'VE HEARD OF A JEWEL OF FABULOUS WEALTH LOST SOMEWHERE IN THE COMPLEX BELOW"
1850 IFRS>5ORRS>4THENPRINT"THEY SAY THAT THEY ARE JUST TRAVELLING BY AND HAD STOPPED TO LOOK INSIDE.THEY BACK OUT SLOWLY"
1860 IFRS>3THENPRINT"THEY TELL YOU OF FOUL DEMONS & DRAGONS LURKING BELOW. AND THEN LEAVE YOU HASTILY !!!"
1870 IFRS>2THENPRINT"THEY RELUCTANTLY HINT AT A TALE OF A MAGICAL STONE WHICH IS

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PROGRAMS

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RUNNED TO GRANT ANY WISH !!")
1880 GOSUB40: RETURN
1890 N=XX
1900 GOSUB70: PRINT@288, "USE WEAPON, MAGIC OR DISENCHARGE" GOSUB40 IFK$="M" THEN GOSU
B2690: GOSUB50: LF=1: GOSUB100: IFA=0 THEN RETURN ELSE GOSUB70
1910 IFK$="D" THEN M1=1: M1=NM: M2=NM: R=PR: FORZ=1 TO NM: KZ=MPX(Z): NEXTZ: GOSUB3340: GOS
UB100: M=1160: FL=0: RETURN
1920 IFNM=0 THEN GOSUB1950
1930 IFNM=0 THEN GOSUB70: PRINT@322, "THE OPPOSITION IS VANQUISHED." GOSUB50: GOSUB22
90: RETURN
1940 GOSUB2080: GOTO1900
1950 PRINT@288, " " FORZ=1 TO M1: IFMPX(Z)<1 THEN1960 ELSE PRINT@320+34Z, Z
1960 NEXT FORZ=1 TO X: PRINT@352, " " PRINT: PRINT: IFHX(X)<1 THEN2070 ELSE PRINT@352, "WHI
CH DOES "N$(X)" STRIKE"
1970 GOSUB40: Y=VAL(K$): IFY<100Y: M1 ORMPX(Y)<1 THEN1970
1980 CH=20-L(X)-SB(X)-MR: RT=RND(20): D=RND(6)+DB(X)+WD: IFA=4 AND W=I THEN D=D+20
1990 IFRT>CH THEN MPX(Y)=MPX(Y)-D ELSE ON RND(2) GOTO2040,2050
2000 IFMPX(Y)<1 THEN PRINTM$(MM), Y, " SLAIN": NM=NM-1: PRINT@320+34Y, " " GOTO2060
2010 ON RND(2) GOTO2020,2030
2020 PRINT "A HIT, CAUSING": D, "DAMAGE." GOTO2060
2030 PRINT "A MIGHTY STRIKE": D, "DAMAGE." GOTO2060
2040 PRINT "YOUR BLOW IS DEFLECTED!" GOTO2060
2050 PRINT "YOUR WILD SWING TOTALLY MISSES."
2060 GOSUB50
2070 IFNM=0 THEN NEXT: RETURN
2080 FORY=1 TO M1: Y1=Y: D=0
2090 IFY=XX ORH(Y1)<1 THENY1=RND(X)
2100 IFMPX(Y)<1 THEN2230 ELSE MH=20-MD-AC(Y1): RT=RND(20): D=RND(INT(4XLOG(L)+4-L)): IF
A=SANDY1=1 THEN D=0
2110 IFH(Y1)<1 THEN2230 ELSE PRINT@384, " " PRINT@352, M$(MM), Y, " STRIKES AT "N$(Y1):
PRINT@416, " "
2120 IFRT>MH THENH(Y1)=H(Y1)-D: ON RND(4) GOTO2140,2150,2160
2130 ON RND(3) GOTO2170,2180,2190
2140 PRINT "A BLOW TO THE HEAD": D, "DAMAGE" GOTO2200
2150 PRINT "YOUR CHEST IS STRUCK!": D, "DAMAGE" GOTO2200
2160 PRINT "A STRIKE TO YOUR ARM": D, "DAMAGE" GOTO2200
2170 PRINT "YOU SKILLFULLY DEFLECT THE BLOW" GOTO2220
2180 PRINT "SAVED BY YOUR ARMOUR!" GOTO2220
2190 PRINT "YOU DEFTLY AVOID THE BLOW" GOTO2220
2200 IFH(Y1)<1 THEN PRINT@400, N$(Y1), " -dead!": N=N-1: GOSUB50
2210 IFN=0 THEN CLS: PRINT@227, "YOUR PARTY ARE ALL DEAD." END
2220 GOSUB50
2230 NEXT: RETURN
2240 GOSUB70: PRINT@296, "PARTY STATUS:" PRINT@330, "L HP AC GP WT" FORX=1 TO X
X: PRINTN$(X): PRINT@329+X*32, " " PRINTUSING"###" L(X): PRINT " "
2250 PRINTUSING"###" H(X): PRINT " " PRINTUSING"###" AC(X): PRINT " " PRINTUSING"
####" G(X): PRINT " " PRINTUSING"####" W(X)
2260 NEXTX: PRINT@480, "TOTAL COMBAT EXPERIENCE:" MT: GOSUB40: GOSUB250: RETURN
2270 FORX=1 TO X: CLS: PRINTN$(X): FORY=1 TO5: PRINTM$(X), Y: NEXT: GOSUB40: NEXT: IFCC=1 TH
EN PRINT@384, "X DEAD COMRADE BEING CARRIED X" GOSUB50:2280 LF=1: GOSUB100: RETURN
2290 MT=INT(MT+HE): HE=0: FORZZ=1 TO250:
2300 GOSUB70: PRINT@288, "HEAL WOUNDED. SEARCH BODIES. LEAVE."
2310 GOSUB40: IFK$="L" THEN RETURN
2320 IFK$="S" THEN GOSUB2350
2330 IFK$="H" THEN GOSUB2420
2340 NEXTZ
2350 IFSB=1 THEN PRINT@384, "YOU'VE ALREADY SEARCHED THE BODIES - NOTHING MORE
IS FOUND." GOSUB50: RETURN
2360 FORZ=1 TO M1: RT=RND(20): RP=L+RND(100)
2370 PRINT@384, "WHO SEARCHES "M$(MM): Z: GOSUB80
2380 IFRT<8 THEN PRINT@416, "NOTHING FOUND ON "M$(MM): Z: GOTO2410
2390 RS=INT(RT/L/2): PRINT@416, RS, " GOLD": IFRT<20 THEN RP=0 ELSE PRINT "A GEM WORTH
"RP: "GP"
2400 PRINT "FOUND ON "M$(MM): Z: IFRP+RS<W(X) THEN W(X)=W(X)+RP+RS: G(X)=G(X)+RP
+RS
2410 GOSUB50: PRINT@384, " " PRINT: PRINT: NEXTZ: SB=1: RETURN
2420 H1=0: PRINT@384, "WHO DO YOU WISH TO ADMINISTER TO" GOSUB80: N1$=N$+U$X
2430 FORZ=1 TO X: FORY=1 TO5: IFH(U)<1 AND T$(Z,Y)=TF$(50) THEN PRINT@416, N$(Z), " HAS A
SCROLL OF RAISE DEAD": H1=2: Z1=Z: Y1=Y
2440 IFH(U)<1 AND T$(Z,Y)=TF$(63) THEN PRINT@416, N$(Z), " HAS A RING OF REGENERATION"
H1=1
2450 IFH(U)<1 AND L(Z)>8 AND C(Z)= "CLERIC" THEN PRINT@384, "YOUR" L(Z), "TH LEVEL CLERI
C HAS THE POWER TO BRING "N$," BACK TO LIFE." H1=3
2460 IFH(U)<1 AND L(Z)>11 AND C(Z)= "DRUID" OR C(Z)= "MAGICIAN" THEN PRINT@384, N$(Z), "
HAS THE POWER TO RE-INCARNATE "N$: H1=4
2470 NEXTZ: IFH1=0 THEN GOSUB50: GOTO2530
2480 IFH(X)<1 AND M1=0 THEN PRINT@352, "YOUR PARTY HAVE NO MEANS TO HELP YOUR DEAD COM
RADE. WILL YOU CARRY YOUR FRIEND, TAKE ITEMS FROM THE BODY OR LEAVE IT AS FALLEN."
GOSUB40: GOSUB2590: RETURN
2490 GOSUB70: PRINT@320, "WHO WILL TEND TO "N1$: GOSUB80: IFC$(X)= "CLERIC" OR C$(X)
="DRUID" AND L(X)>1: AND CL(X) THEN CL=CL+1: GOSUB2670: RETURN
2500 IFC$(X)= "PALADIN" AND L(X)>1: THEN LH=LH+1: GOSUB2670: RETURN
2510 FORZ=1 TO X: FORY=1 TO5: IF T$(Z,Y)=TF$(1) OR T$(Z,Y)=TF$(2) OR T$(Z,Y)=TF$(3) OR T$(Z,Y)=TF$(4) OR T$(Z,Y)=TF$(5) OR T$(Z,Y)=TF$(6) OR T$(Z,Y)=TF$(7) OR T$(Z,Y)=TF$(8) OR T$(Z,Y)=TF$(9) OR T$(Z,Y)=TF$(10) OR T$(Z,Y)=TF$(11) OR T$(Z,Y)=TF$(12) OR T$(Z,Y)=TF$(13) OR T$(Z,Y)=TF$(14) OR T$(Z,Y)=TF$(15) OR T$(Z,Y)=TF$(16) OR T$(Z,Y)=TF$(17) OR T$(Z,Y)=TF$(18) OR T$(Z,Y)=TF$(19) OR T$(Z,Y)=TF$(20) OR T$(Z,Y)=TF$(21) OR T$(Z,Y)=TF$(22) OR T$(Z,Y)=TF$(23) OR T$(Z,Y)=TF$(24) OR T$(Z,Y)=TF$(25) OR T$(Z,Y)=TF$(26) OR T$(Z,Y)=TF$(27) OR T$(Z,Y)=TF$(28) OR T$(Z,Y)=TF$(29) OR T$(Z,Y)=TF$(30) OR T$(Z,Y)=TF$(31) OR T$(Z,Y)=TF$(32) OR T$(Z,Y)=TF$(33) OR T$(Z,Y)=TF$(34) OR T$(Z,Y)=TF$(35) OR T$(Z,Y)=TF$(36) OR T$(Z,Y)=TF$(37) OR T$(Z,Y)=TF$(38) OR T$(Z,Y)=TF$(39) OR T$(Z,Y)=TF$(40) OR T$(Z,Y)=TF$(41) OR T$(Z,Y)=TF$(42) OR T$(Z,Y)=TF$(43) OR T$(Z,Y)=TF$(44) OR T$(Z,Y)=TF$(45) OR T$(Z,Y)=TF$(46) OR T$(Z,Y)=TF$(47) OR T$(Z,Y)=TF$(48) OR T$(Z,Y)=TF$(49) OR T$(Z,Y)=TF$(50) OR T$(Z,Y)=TF$(51) OR 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PROGRAMS

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2650 N%(U)="":C%(U)="":R%(U)="":W1%(U)="":W2%(U)="":W3%(U)="":A%(U)="":
2660 L(U)=0:S(U)=0:I(U)=0:W(U)=0:C(U)=0:D(U)=0:R(U)=0:B%(U)="":GP(U)=0:HP(U)=0:
B(U)=0:DB(U)=0:WAK(U)=0:AC(U)=0:WE(U)=0:RETURN
2670 RS=RND(6)+2:IFRS+H(U)>HP(U)THENRS=HP(U)-H(U)
2680 IFCF=1THENPRINT@352,"YOUR SPELL IS NOT YET RECHARGED YOU MUST RECOVER YOUR
STRENGTH!":RETURNELSEPRINT@352,C%(X):" YOU HAVE CURED"PRINTRS:" DAMAGE FOR "H%(
(U):" H(U)=H(U)+RS:GOSUB50:CF=1:RETURN
2690 PRINT@320,"WHO CASTS MAGIC...?":GOSUB80:IFH%(X)THENPRINT"he is dead":R=R2
:RETURN
2700 CLS:PRINTH%(X):" YOU KNOW " :FORY=1TO8:PRINTSV%(X,Y):NEXT
2710 PRINT"YOU CARRY " :FORY=1TO5:PRINTT%(X,Y):NEXT
2720 PRINT@480,"SPELL OR ARTIFACT?":GOSUB40:IFK%="S"ORR%="A"THEN2730ELSER=R2:RE
TURN
2730 IFK%="I"THENLF=1ELSELF=0
2740 IFL=0:GOSUB70ELSEFORY=0TO7:PRINT@324Y:":":NEXT
2750 PRINT@480,"WHICH.....?":GOSUB40
2760 K=ASC(K%)+64:R%=CHR$(K+96):FORY=1TO5:IFLF=1ANDLEFT$(T%(X,Y),6)="POTION"ORL
EFT$(T%(X,Y),6)="SCROLL":ANDINSTR(9,T%(X,Y),R%)>0THENSV%(X,Y)="
2770 IFRND(100)>94ANDINSTR(9,T%(X,Y),R%)>0ANDLEFT$(T%(X,Y),4)="RING"ORLEFT$(T%(
X,Y),4)="WAND":THENH%(X,Y)="PRINT"last charge":GOSUB50
2780 NEXT Y:IFLF=0THENFORY=1TO8:IFINSTR(1,SV%(X,Y),R%)>0THENSV%(X,Y)="ELSENEXT
2790 IFL=0THENFORY=1TO8:IFRND(100)>90ANDINSTR(1,SV%(X,Y),R%)>0ANDLEFT$(SV%(X,Y
),4)="RING"ORLEFT$(SV%(X,Y),4)="WAND":THENS%(X,Y)="PRINT"last charge":GOSUB50E
LSENEXT
2800 FORSS=1056TO1500:IFFEK(SS)=K:THEN2820ELSENEXT
2810 PRINT@480,"NOT AVAILABLE.....":R=R2:GOSUB50:RETURN
2820 A=0:C%=LEFT$(C%(X),1):CLS
2830 IFK=2ANDC%="I"ORLF=1THENPRINT"A BLINDNESS AFFLICTS THE "H%(MM):"ALLOWIN
G YOU TO DESPATCH THEM":A=1
2840 IFK=3ANDC%="I"ORC%="D"ORLF=1THENPRINT"THE "H%(MM):" ARE THROWN INTO DISA
RRAY ALLOWING YOU TO STRIKE UNHINDERED":A=1
2850 IFK=4ANDRIGHT$(H%(MM),6)="DRAGON"THENPRINT"THE DRAGON BECOMES DOCILE AND
LIES DOWN QUIETLY":A=2
2860 IFK=5ANDC%="D"ORLF=1THENPRINT"THE "H%(MM):" SUDDENLY BECOME ENTRACTED IN
A MASS OF VINES,ALLOWING YOU TO KILL THEM":A=1
2870 IFK=6ANDC%="M"ORC%="D"ORLF=1THENPRINT"FIRE SHOTS AT THE MONSTERS AND DAM
AGES THEM CONSIDERABLY":A=3
2880 IFK=7THENPRINT"YOU FEEL A SUDDEN SURGE OF GREATSTRENGTH & CHARGE THE FOE":
A=4
2890 IFK=8ANDC%="C"ORLF=1THENPRINT"THE OPPOSITION IS HELD FAST.....UNABLE TO A
TTACK OR DEFEND":A=2
2900 IFK=9THENPRINTH%(X):" SUDDENLY DISAPPEARS FROM VIEW":A=5
2910 IFK=12ANDC%="M"ORC%="D"ORLF=1THENPRINT"LIGHTNING BURSTS FORTH FROM YOU":
A=3
2920 IFK=13ANDC%="M"ORLF=1THENPRINTL(X):"MAGIC MISSILES SPEED FROM YOUR H
ANDS & STRIKE THE "H%(MM):A=3
2930 IFK=14THENPRINT"THE STAFF OF STRIKING CRACKLES WITH POWER - BLUE FLAME BUR
STINGFORTH":A=3
2940 IFK=15ANDC%="M"ORLF=1THENPRINT"AN ICE STORM ENVELOPES THE "H%(MM):" FEEZ
ING THEM SOLID":A=2
2950 IFK=16ANDC%="M"ORLF=1THENPRINT"THE "H%(MM):" FALL UNDER YOUR SPELL":A=
2
2960 IFK=18THENPRINT"THE "H%(MM):" ARE STRUCK WITH FEAR AND FLEE THE ROOM":A=
6
2970 IFK=19ANDC%="M"ORLF=1THENPRINT"THE "H%(MM):" SUDDENLY FALL TO THE FLOOR.
..ASLEEP":A=2
2980 IFK=20ANDC%="M"ORLF=1THENPRINT"STRENGTH FLOODS INTO YOU":A=4
2990 IFK=22THENPRINT"YOU FEEL INVULNERABLE AS AN AURAOF POWER ENVELOPS YOU":A=
5
3000 IFK=24ANDC%="M"ORLF=1THENPRINT"AS YOU COMPLETE THE SPELL THE "H%(MM):" FA
3010 IFK=25ANDC%="I"ORLF=1THENPRINT"A COLOUR SPRAY CONFUSES THE "H%(MM):" AND
YOU ARE ABLE TO STRIKE UNHINDERED":A=1
3020 IFK=26ANDC%="I"ORLF=1THENPRINT"THE "H%(MM):" ARE PARALYZED":A=2
3030 IFA=1THENNM=0
3040 IFA=2THENRT=(L+LOG(L)*RND(20))/L(X):IFRT>15THENPRINT" BUT THEY QUICKLY RECO
VER...":ELSENM=0
3050 IFA=3THENFORY=1TO11:NP(Y)=NP(Y)-RND(6)*L(X):IFNP(Y)<1THENNM=NM-1:NEXT
3060 IFA=4THENI=X
3070 IFA=5THENI=X
3080 IFA=6THENRETURN
3090 LF=1:RETURN
3100 CLS:PRINT@5,"*DO YOU WISH TO SAVE*:PRINT@39,"*THESE CHARACTERS*:PRINT@80,
"R":PRINT@104,"*THIS ADVENTURE*"
3110 GOSUB40:IFK%="N"THENGOSUB100:RETURN
3120 PRINT:PRINT"PREPARE TAPE & THEN PRESS ANY KEY.....":GOSUB40
3130 CLS:PRINT@234,"*SAVING*:OPEN"0",#-1,"DUNGEON":PRINT#-1,XX:FORX=1TOXX
3140 PRINT#-1,H%(X),R%(X),C%(X),L(X),S(X),I(X),W(X),C(X),D(X),R(X),B%(X),GP(X),H
P(X),SB(X),DB(X),WAK(X),W1%(X),W2%(X),W3%(X)
3150 PRINT#-1,A%(X),AC(X),LI(X),EC(X),OC(X),GX(X),HX(X),AX(X),WE(X)
3160 FORY=1TO8:PRINT#-1,E%(X,Y),S%(X,Y):NEXTY:FORY=1TO5:PRINT#-1,T%(X,Y):NEXTY:X
PRINT#-1,HT,R,L,CC,DO
3170 CLOSE#-1:CLS:PRINT@234,"*DUNGEON*:PRINT@267,"*SAVED*:END
3180 *X LOAD ADVENTURE *
3190 CLS:PRINT@32,"YOU'RE IN MID-ADVENTURE..!":PRINT"PREPARE TAPE & PRESS ANY KE
Y":GOSUB40:CLS:PRINT@234,"*X LOADING *":PRINT@266,"*X DUNGEON *"
3200 OPEN"1",#-1,"DUNGEON":INPUT#-1,XX:FORX=1TOXX
3210 INPUT#-1,H%(X),R%(X),C%(X),L(X),S(X),I(X),W(X),C(X),D(X),R(X),B%(X),GP(X),H
P(X),SB(X),DB(X),WAK(X),W1%(X),W2%(X),W3%(X)
3220 INPUT#-1,A%(X),AC(X),LI(X),EC(X),OC(X),GX(X),HX(X),AX(X),WE(X)
3230 FORY=1TO8:INPUT#-1,E%(X,Y),S%(X,Y):NEXTY:FORY=1TO5:INPUT#-1,T%(X,Y):NEXTY:X
INPUT#-1,HT,R,L,CC
3240 CLOSE#-1:FORZ=1TOXX:LI=LI+L1(Z):NEXT RETURN
3250 *LOAD INITIAL CHARACTERS
3260 CLS:PRINT:PRINT" ** WELCOME TO BRIMSTONE **":PRINT:PRINT" YOU MAY ADVENTUR
E WITH UP TO FOUR MEMBERS,":PRINT:PRINT" HOW MANY CHARACTERS WILL YOUR PART
Y COMPRISE ":INPUTXX
3270 IFXX<1ORXX>4THEN3260
3280 FORX=1TOXX:PRINT:PRINT" PREPARE THE TAPE TO LOAD YOUR CHARACTER,THEN ENTE
R THE NAME OF YOUR CHARACTER...":INPUTH%
3290 CLS:PRINT@234,"*XLOADING*:OPEN"1",#-1,H%(X):IFEOF(-1)THEN3330
3300 INPUT#-1,H%(X),R%(X),C%(X),L(X),S(X),I(X),W(X),C(X),D(X),R(X),B%(X),GP(X),H
P(X),SB(X),DB(X),WAK(X)
3310 INPUT#-1,W1%(X),W2%(X),W3%(X),A%(X),AC(X),LI(X),EC(X),OC(X)
3320 FORY=1TO8:INPUT#-1,E%(X,Y),S%(X,Y):NEXTY:FORY=1TO5:INPUT#-1,T%(X,Y):NEXTY
3330 CLOSE#-1:H(X)=HP(X):WE(X)=WAK(X):PRINT@234,"*XDONE**":NEXTX:FORZ=1TOXX:LI=
LI+L1(Z):NEXTZ:RETURN
3340 ME=0:LF=0:CF=0:AT=0:LN=0:LS=0:LN=0:LE=0:TR=30:SB=0
3350 RESTORE:FORX=1TOR:READ XR,YR,RN,DN,DS,DW,DE,DU,FT,F%(2),F%(3),F%(4):NEXT RE
TURN

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PROGRAMS

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3360 DATA16,7,2,0,3,0,0,0,,ENTRANCE,CHAMBER,16,8,2,-5,1,4,0,0,0,,EMPTY,ROOM
3370 DATA10,6,3,4,0,0,1,0,0,,TABLE,CHAIRS,12,6,4,0,3,0,2,0,0,,BENCHES
3380 DATA4,8,5,6,-2,0,0,0,0,,CORRIDOR,8,8,6,7,5,0,0,0,0,,GUARD,ROOM
3390 DATA8,8,7,0,6,-8,0,0,0,,NOTHING,8,8,0,0,0,9,-7,0,0,,ARMOURY
3400 DATA8,8,9,10,0,19,0,0,1126,,EMPTY,ROOM,4,8,10,11,9,0,0,0,0,,CORRIDOR
3410 DATA8,8,11,0,10,0,0,0,0,0,0,,TABLE,AND,BENCHES,8,8,12,-19,-13,0,0,0,0,,SECRET,RO
OM
3420 DATA8,8,13,-12,0,14,0,0,0,STORE,ROOM,ARMOUR,8,4,14,0,0,15,13,0,0,,CORRIDOR
3430 DATA14,7,15,0,16,18,14,0,0,,RECEPTION,ROOM,12,6,16,15,0,-17,0,0,0,,THRONE,R
OOM
3440 DATA6,6,17,0,0,0,-16,-221,0,BARE,STONE,CHAMBER,10,4,18,0,0,0,15,0,0,,GUARD,
ROOM
3450 DATA8,8,19,0,-12,-20,9,0,0,,EMPTY,CORRIDOR,13,5,20,0,0,0,-19,0,0,,WASH,ROOM
3460 DATA7,7,21,22,0,0,0,117,0,DARK,STAIR,WELL,4,8,22,23,21,0,0,0,0,,CORRIDOR
3470 DATA14,8,23,-24,22,0,0,0,0,ROOM,OF,MIRRORS,14,6,24,0,-23,0,25,0,0,,STUDY,RO
OM
3480 DATA12,6,25,-26,0,24,0,0,0,,LIBRARY,,6,6,26,0,-25,0,0,-338,0,,EMPTY,ROOM
3490 DATA12,8,27,0,0,0,28,0,0,,LABORATORY,,12,6,28,29,0,27,0,0,0,OFFICE,WITH,DES
K
3500 DATA12,6,29,-30,28,0,-31,0,0,,ANTE,CHAMBER,12,6,30,0,-29,0,0,0,0,DAMP,& DIR
TY,CELL
3510 DATA16,4,31,0,0,-29,32,0,0,,CORRIDOR,,14,8,32,33,0,31,0,0,0,BENCHES,AND,TAB
LES
3520 DATA8,6,33,0,32,0,0,-334,0,,SMALL,CHAPEL,8,6,34,0,0,-35,0,233,0,EMPTY,STAI
R,WELL
3530 DATA16,6,35,0,0,36,-34,0,0,,ROBING,ROOM,16,0,36,0,-39,37,35,0,0,LARGE,THRON
E,ROOM
3540 DATA8,8,37,0,0,-38,36,0,0,,SMALL,DRESSING,ROOM,8,7,38,0,0,0,-37,226,0,GUARD,
ROOM,& STAIRS
3550 DATA10,8,39,-36,40,0,0,0,0,,TROPHY,CHAMBER,8,8,40,39,0,0,0,441,0,SMALL,SITT
ING,ROOM
3560 DATA8,8,41,0,42,0,-52,340,0,STORE,(FOOD),ROOM,16,0,42,41,43,0,0,0,0,,LARGE,
KITCHEN
3570 DATA14,8,43,42,44,0,0,0,0,,BANQUET,ROOM,16,0,44,43,0,0,45,0,0,,GREAT,HALL
3580 DATA14,8,45,0,0,44,46,0,0,LARGE,DINING,ROOM,12,7,46,0,0,45,-47,0,0,COMBINED
,PANTRY,& KITCHEN
3590 DATA8,8,47,48,0,-46,0,-557,0,,LOUNGE,,5,8,48,49,47,0,0,0,0,,CORRIDOR
3600 DATA12,8,49,-50,48,0,0,0,0,SERVANT'S,DORMITORY,,8,8,50,0,-49,0,0,-553,0,,ST
ORE,ROOM
3610 DATA16,4,51,0,0,52,-50,0,0,,CORRIDOR,,14,8,52,0,0,-41,51,0,0,,LARGE,REFRECT
ORY
3620 DATA8,8,53,0,56,0,54,450,0,STORE,ROOM,,8,8,54,0,55,53,0,0,0,,UNTIDY,WORKSHO
P
3630 DATA8,8,55,54,0,56,0,-658,0,,EMPTY,ROOM,8,8,56,53,0,0,55,0,0,SMALL,WEAPONS,
SMITHY
3640 DATA10,8,57,0,0,0,0,447,0,,EMPTY,CELL,8,8,58,0,64,0,-59,555,0,,EMPTY,CELL
3650 DATA16,5,59,0,0,-56,60,0,0,,CORRIDOR,,14,8,60,61,0,59,0,0,0,,BARRACKS
3660 DATA14,8,61,0,60,62,0,0,0,SEVERAL,CRUDE,BEDS,16,0,62,0,0,-63,61,0,0,TRAININ
G,EXERCISE,ROOM/GYM
3670 DATA8,8,63,0,0,0,-62,-771,0,EMPTY,STAIR,WELL,4,8,64,58,65,0,0,0,0,,CORRIDO
R
3680 DATA8,8,65,64,0,0,66,0,0,,TORTURE,CHAMBER,8,8,66,0,67,65,0,0,0,,PRISON,CELL
S
3690 DATA8,8,67,66,0,0,68,0,0,,GUARD'S,ROOM,8,8,68,0,69,67,0,0,0,MOKE,PRISON,CEL
LS
3700 DATA8,8,69,68,0,0,-70,0,0,,STRONG,ROOM,8,8,70,0,0,-69,0,0,0,,SECRET,CHAMBER
3710 DATA8,8,71,72,74,73,75,663,0,DARK,EERIE,ROOM,8,8,72,0,71,0,0,0,0,SLINE,COVE
RED,WALLS
3720 DATA8,8,73,0,0,0,71,0,0,FOUL,SMELLING,BESTIARY,8,8,74,71,0,0,0,0,0,DARK,GLO
OMY,CRYPT
3730 DATA8,8,75,0,0,71,0,0,0,,SEVERAL,TOMBS
3740 FORX=1TO66:READTF$(X):NEXT RETURN
3750 DATA POTION,..OF HEALING,SCROLL,..OF CURE LIGHT WOUNDS,SCROLL,..OF ENTANGLE
,SCROLL,..OF MAGIC MISSILE
3760 DATA SCROLL,..OF CHARM PERSON,SCROLL,..OF SLEEP,SCROLL,..OF COLOUR SPRAY,RI
NG,...OF WARNTH,WAND,...OF MAGIC MISSILES
3770 DATA CHAINMAIL+1,SHIELD...+1,SWORD....+1,AXE.....+1,DAGGER...+1,MACE....+1
3780 DATA POTION,..OF EXTRA-HEALING,SCROLL,..OF HOLD PERSON,SCROLL,..OF INVULNER
ABILITY,SCROLL,..OF BLINDNESS,RING,...OF INVISIBILITY,CLOAK,...OF PROTECTION+1
3790 DATA DAGGER...+2,SWORD....+2,AMULET OF GOLD & PLATINUM,BAG....OF DEVOURING
3800 DATA POTION,..OF INVISIBILITY,SCROLL,..OF CALL LIGHTNING,SCROLL,..OF INVI
SIBILITY,SCROLL,..OF PARALYZATION,RING,...OF PROTECTION+1,WAND....OF FIRE
3810 DATA CHAINMAIL+2,SHIELD...+2,AXE.....+2,SPEAR....+2,RED PEARL,SAPPHIRE
3820 DATA POTION,..OF INVULNERABILITY,SCROLL,..OF CURE DISEASE,SCROLL,..OF STREN
GTH,SCROLL,..OF LIGHTNING BOLT,SCROLL,..OF FIREBALL,SCROLL,..OF CHAOS,WAND.....O
F FEAR
3830 DATA PLATEMAIL+1,SWORD....+3,EMERALD STAR RUBY
3840 DATA POTION,..OF GIANT STRENGTH,SCROLL,..OF RAISE DEAD,SCROLL,..OF HALL OF
FIRE,SCROLL,..OF ICE STORM,RING,...OF FEATHER FALL,WAND,...OF STRIKING
3850 DATA AXE.....+3,DAGGER...+3,MACE....+2,FIRE OPAL DIAMOND..
3860 DATA POTION,..OF DRAGON CONTROL,SCROLL,..OF CONFUSION,SCROLL,..OF DEATH SPE
LL(<>),RING,...OF REGENERATION,PLATEMAIL+2,MOONSTONE,CROWN OF GODS
3870 FORX=1TO88:READTM(X):NEXT RETURN
3880 DATA BANDIT,BERSERKER,ORG,GOBLIN,KOBOLD,GHOUL,GNOLL,IMP,GIANT ANT,BUGBEAR
3890 DATA LIZARDMEN,CARRION CRAWLER,GIANT ANT,SKELETON,STARJACK,GIANT CENTIPEDE,WO
LVEN,TROGLODYTE,EVIL DWARVES,SHRIEKER
3900 DATA HOBGOBLIN,FIRE-IMP,GIANT TICK,HARPIES,MUMMIES,MYNE,LEMURE,LARVA,FIRE B
EETLE,WEREWOLVES
3910 DATA OGRE,OWLBEAR,GIANT SPIDER,TROLL,ZOMBIE,BASILISK,CAVE BEAR,BLINK DOG,CE
NTRAUR,COCKATRICE
3920 DATA SUCCUBUS,WHIMPERING,ERINYES,LAMIA,SPECTRE,HYDRA,GELATINOUS CUBE,GHOST,STO
NE GIANT,STONE GOLEM
3930 DATA CHIMERA,COURTL,GIANT APE,GIANT SHARK,ETTIN,GORGON,GRIFFON,GARGOYLE,MAN
TICORE,MINOTAUR
3940 DATA ROPE,RUST MONSTER,VAMPIRE,UMBER HULK,NIGHT,WORN,WYVERN,WRAITH,D.TINNIT
ITYUGH,MIND FLAYER,LICH
3950 DATA IRON GOLEM,BALROG,DRAGONNE,BLACK DRAGON,CHROMATIC DRAGON,GREEN DRAGON,
RED DRAGON,WHITE DRAGON

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PROGRAMS

Spectrum Golf

by Chic James

As the name says, this is a golf simulation for the Sinclair Spectrum. Instructions are included in the program for nine- and 18-hole games.

If two people want to play simultaneously, you'll need a microdrive in which to store the hole design. One-player games can be run on cassette-

based systems.

One word of warning — the game is won or lost on the putting green.

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1 REM "golf" BY CHIC JAMES
5 BRIGHT 1
8 BORDER 5: PAPER 4: INK 0
9 CLS : GO SUB 9100
10 GO SUB 9900
15 GO SUB 9700
30 PRINT PAPER 7: BRIGHT 1: I
NVERSE 1: AT 20,0: "HOW MANY HOLES
DO YOU WISH TO PLAY ?
40 INPUT PAPER 7: INK 0: BRIG
HT 1: "ENTER 9 or 18 ":h
45 CLS
50 INPUT PAPER 7: INK 0: BRIG
HT 1: "ENTER 1 or 2 PLAYERS "ipla
yers
60 IF players>2 THEN GO TO 50
90 GO SUB 1000
100 REM ** play one hole **
105 INPUT PAPER 2: INK 7: "PLAY
ER ": (p1): " ENTER ANGLE: ":a
107 IF a>180 THEN GO TO 3003
110 PRINT AT 1,0: PAPER 2: INK
7: "ANGLE ":a: "
120 INPUT PAPER 1: INK 7: "PLAY
ER ": (p1): " ENTER SWING: ":d
125 IF d>200 THEN GO TO 120
130 PRINT AT 2,0: PAPER 1: INK
7: "SWING ":d: "
135 LET d=d/2
140 LET x=INT (d*COS (a/180*PI)
)+q
150 LET y=INT (d*SIN (a/180*PI)
)+r
155 GO SUB 6080
160 CIRCLE INK 7:x,y,1
163 IF x>=c-20 AND x<=c+20 AND
y>=b-20 AND y<=b+20 THEN GO TO
170
165 PLOT q,r: DRAW x-q,y-r
170 LET q=x
180 LET r=y
190 IF x>=c-1 AND x<=c+1 AND y>
=b-1 AND y<=b+1 THEN GO TO 3000
200 GO SUB 6000
290 LET s=s+1
295 PRINT AT 0,0: PAPER 0: INK
7: "STROKE No. ":s
320 GO TO 105
999 REM *** set out hole ***
1000 IF p1=2 THEN GO TO 1600
1002 CLS : FOR n=0 TO 2: PRINT A
T n,0: PAPER 0: "
": NEXT n
1005 LET z=z+1: PRINT AT 1,16: P
APER 0: INK 7: "HOLE No. ":z
1010 LET q=10: LET r=10
1030 LET s=1
1100 FOR n=1 TO 30
1110 LET a=3+INT (RND*18)
1120 LET b=1+INT (RND*31)
1130 PRINT AT a,b: PAPER 8: INK
0: "H"
1140 NEXT n
1150 FOR n=1 TO 5
1160 LET a=3+INT (RND*13)
1170 LET b=1+INT (RND*27)
1180 LET c=1+INT (RND*5)
1190 FOR m=1 TO c
1200 PRINT AT a+m,b: PAPER 8: IN
K 0: "H"
1210 NEXT m
1220 NEXT n
1230 LET i=3+INT (RND*15)
1240 LET j=1+INT (RND*27)
1245 PRINT AT i-1,j-1: PAPER 3:
INK 2: " "
1250 PRINT AT i,j-1: PAPER 3: "
"
1260 PRINT AT i+1,j-1: PAPER 3: "
"
1270 PRINT AT i+2,j-1: PAPER 3: "
"
1275 PRINT AT i+3,j-1: PAPER 3: "
"
1280 LET c=j*8+12
1290 LET b=175-(i*8+10)
1300 CIRCLE c,b,2
1310 GO SUB 5000
1320 PRINT AT i+1,j+1: PAPER 3: "
"
1330 CIRCLE c,b,2
1370 PRINT AT 0,16: PAPER 0: INK
7: "TOTAL STROKES: ":e(p1)
1390 PRINT AT 1,0: PAPER 2: INK
7: "ANGLE ":AT 2,0: PAPER
1: INK 7: "SWING "
1395 PRINT AT 0,0: PAPER 0: INK
7: "STROKE No. ":s
1400 LET l=c+b
1405 IF l>=10 THEN LET p=2
1410 IF l>=100 THEN LET p=3
1420 IF l>=200 THEN LET p=4
1430 IF l>=300 THEN LET p=5
1440 PRINT AT 2,16: PAPER 0: INK
7: "PAR: ":p: " ":l: "Yds. "
1450 FOR n=19 TO 21
1460 PRINT AT n,0: PAPER 6: " "
1470 NEXT n
1480 PRINT AT 19,0: PAPER 6: INK
0: "T"
1490 PRINT PAPER 8: AT 10,15: "H"
: AT 11,16: "H": AT 17,15: "H": AT 11
,22: "H"
1500 PRINT PAPER 8: AT 8,4: "H": A
T 8,11: "H": AT 8,18: "H": AT 8,26: "
H"
1510 PRINT PAPER 8: AT 15,4: "H":
AT 15,11: "H": AT 15,18: "H": AT 15,
26: "H"
1520 CIRCLE INK 7:q,r,1
1530 IF players=1 THEN GO TO 10
0
1549 REM *** SAVE HOLE ***
1550 ERASE "m": i: "hole"
1560 SAVE "m": i: "hole" SCREEN#
1565 VERIFY "m": i: "hole" SCREEN#
1570 GO TO 100
1599 REM *** LOAD HOLE ***
1600 LOAD "m": i: "hole" SCREEN#
1610 LET q=10: LET r=10
1620 LET s=1
1630 PRINT AT 0,16: PAPER 0: INK
7: "TOTAL STROKES: ":e(p1)
1640 GO TO 100
2999 REM *** holed shot ***
3000 LET e(p1)=e(p1)+s: PRINT AT
21,8: PAPER 2: INK 7: FLASH 1: "
H O L E D "
3005 GO SUB 7300
3010 PRINT AT 0,16: PAPER 0: INK
7: "TOTAL STROKES: ":e(p1)
3015 PAUSE 100
3016 IF p1=1 THEN LET t(z)=s
3017 IF p1=2 THEN LET i(z)=s
3018 LET v(z)=p
3020 PRINT AT 10,6: PAPER 6: INK
0: s: " STROKES FOR HOLE No. ":z
3021 IF players=1 THEN GO TO 30

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PROGRAMS

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25
3022 IF p1=1 THEN LET p1=2: PAU
SE 100: GO TO 1000
3025 LET k=k+p
3030 PRINT AT 2,16: PAPER 0: INK
7: "PAR: "; p: " "; 1: "Yds."
3035 PAUSE 100
3040 LET p=0: LET 1=0
3050 IF z=h THEN GO TO 4000
3055 LET p1=1
3060 GO TO 1000
3999 REM *** end of round ***
4000 CLS : PRINT BRIGHT 1: AT 0,
3: PAPER 7: INK 0: "PAR FOR THIS
COURSE WAS: "; k
4002 GO SUB 4500
4005 LET p1=1
4010 IF k=e(p1) THEN GO TO 4100
4020 IF k>e(p1) THEN GO TO 4200
4030 IF k<e(p1) THEN GO TO 4300
4100 IF p1=1 THEN LET x1=0
4102 IF p1=2 THEN LET x1=16
4105 PRINT AT 1,x1: PAPER 3: INK
7: "PLAYER "; p1: AT 21,x1: e(p1):
": LEVEL PAR "
4115 IF players=1 THEN GO TO 44
00
4120 IF p1=1 THEN LET p1=2: GO
TO 4010
4130 GO TO 4400
4200 LET u=k-e(p1)
4202 IF p1=1 THEN LET x1=0
4203 IF p1=2 THEN LET x1=16
4210 PRINT AT 1,x1: PAPER 1: INK
7: "PLAYER "; p1: AT 21,x1: e(p1):
": "; u: " UNDER PAR "
4225 IF players=1 THEN GO TO 44
00
4230 IF p1=1 THEN LET p1=2: GO
TO 4010
4240 GO TO 4400
4300 LET o=e(p1)-k
4302 IF p1=1 THEN LET x1=0
4303 IF p1=2 THEN LET x1=16
4310 PRINT AT 1,x1: PAPER 2: INK
7: "PLAYER "; p1: AT 21,x1: e(p1):
": "; o: " OVER PAR "
4325 IF players=1 THEN GO TO 44
00
4330 IF p1=1 THEN LET p1=2
4410 INPUT BRIGHT 1: INK 7: PAP
ER 0: FLASH 1: "ANOTHER ROUND? (Y
or N) "; c$
4420 IF c$="y" THEN GO TO 15
4430 IF c$<>"y" THEN STOP
4500 PRINT AT 1,11: "PAR": AT 1,28
: "HOLE"
4505 FOR n=1 TO h
4510 PRINT AT n+1,5: t(n): AT n+1,
12: v(n): AT n+1,21: i(n): AT n+1,29
: n
4520 NEXT n
4530 RETURN
4998 REM ** set up hazards **
4999 REM ** cap's in " " =
U.D.G's. **
5000 FOR n=1 TO 3
5002 LET q(n)=3+INT (RND*12)
5003 GO SUB 7000
5005 FOR m=q(n) TO q(n)+2
5010 PRINT AT m,ch: PAPER 8: INK
5: " "
5020 NEXT m
5022 NEXT n
5025 FOR n=4 TO 5
5030 LET q(n)=3+INT (RND*12)
5032 GO SUB 7000
5035 FOR m=q(n) TO q(n)+2
5040 PRINT AT m,ch: PAPER 8: INK
2: " "
5050 NEXT m
5055 NEXT n
5100 FOR n=7 TO 10
5110 LET q(n)=1+INT (RND*28)
5120 LET w(n)=q(n)*8
5125 LET f(n)=w(n)+23
5127 GO SUB 7100
5130 PRINT AT ch,q(n): PAPER 8:
INK 6: " "
5140 NEXT n
5150 LET n=6
5160 LET q(n)=4+INT (RND*25)
5170 LET w(n)=q(n)*8
5180 LET f(n)=w(n)+23
5190 GO SUB 7100
5200 FOR m=ch TO ch+2
5210 PRINT AT m,q(n): PAPER 8: I
NK 2: " "
5220 NEXT m
5230 IF n=11 THEN RETURN
5240 LET n=11: GO TO 5160
5999 REM ** check hazards **
6000 GO TO 8000
6005 IF x>=64 AND x<=71 AND y=w
(1) AND y<=f(1) THEN GO TO 6100
6010 IF x>=136 AND x<=143 AND y>
=w(2) AND y<=f(2) THEN GO TO 61
00
6020 IF x>=192 AND x<=199 AND y>
=w(3) AND y<=f(3) THEN GO TO 61
00
6030 IF x=w(10) AND x<=f(10) AN
D y>=40 AND y<=47 THEN GO TO 62
00
6035 IF x=w(7) AND x<=f(7) AND
y>=112 AND y<=119 THEN GO TO 62
00
6040 IF x=w(8) AND x<=f(8) AND
y>=96 AND y<=103 THEN GO TO 620
0
6050 IF x=w(9) AND x<=f(9) AND
y>=56 AND y<=63 THEN GO TO 6200
6060 IF x>=8 AND x<=31 AND y=w(
4) AND y<=f(4) THEN GO TO 6300
6065 IF x=w(11) AND x<=f(11) AN
D y>=0 AND y<=23 THEN GO TO 630
0
6070 IF x=w(6) AND x<=f(6) AND
y>=128 AND y<=151 THEN GO TO 63
00
6075 IF x>=224 AND x<=247 AND y>
=w(5) AND y<=f(5) THEN GO TO 63
00
6077 RETURN
6079 REM * check out of bounds *
6080 IF x<1 THEN GO TO 6400
6085 IF x>254 THEN GO TO 6500
6087 IF y>152 THEN GO TO 6600
6090 IF y<1 THEN GO TO 6700
6095 RETURN
6099 REM ** inform penalty's **
6100 PRINT AT 21,0: PAPER 6: INK
0: FLASH 1: " IN THE WATER: LOSE
TWO STROKES "
6105 GO SUB 7200
6110 LET s=s+2
6120 PRINT AT 0,0: PAPER 0: INK
7: "STROKE No. "; s
6130 PAUSE 50
6140 PRINT AT 21,0: PAPER 6: "
": PAPER 4: "
6145 PRINT AT 21,q(11): PAPER 4:
INK 2: " "
6150 RETURN
6200 PRINT AT 21,5: PAPER 6: INK
0: FLASH 1: " BUNKERED: LOSE ONE
STROKE "
6205 GO SUB 7200
6210 LET s=s+1
6220 PRINT AT 0,0: PAPER 0: INK
7: "STROKE No. "; s
6230 PAUSE 50
6240 PRINT AT 21,0: PAPER 6: "
": PAPER 4: "
6245 PRINT AT 21,q(11): PAPER 4:
INK 2: " "
6250 RETURN
6300 PRINT AT 21,0: PAPER 6: INK
0: FLASH 1: " IN THE WOODS: LOSE
ONE STROKE "
6305 GO SUB 7200
6310 LET s=s+1
6320 PRINT AT 0,0: PAPER 0: INK
7: "STROKE No. "; s
6330 PAUSE 50
6340 PRINT AT 21,0: PAPER 6: "
": PAPER 4: "
6345 PRINT AT 21,q(11): PAPER 4:
INK 2: " "

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PROGRAMS

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6350 RETURN
6400 PRINT AT 21,0; PAPER 6; INK
0; FLASH 1;" OUT OF BOUNDS:LOSE
ONE STROKE "
6405 GO SUB 7200
6410 LET s=s+1
6420 LET x=1
6430 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. "s
6435 PAUSE 50
6440 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
"
6445 PRINT AT 21,q(11); PAPER 4;
INK 2;"***"
6450 RETURN
6500 PRINT AT 21,0; PAPER 6; INK
0; FLASH 1;" OUT OF BOUNDS:LOSE
ONE STROKE "
6505 GO SUB 7200
6510 LET s=s+1
6520 LET x=254
6530 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. "s
6535 PAUSE 50
6540 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
"
6545 PRINT AT 21,q(11); PAPER 4;
INK 2;"***"
6550 RETURN
6600 PRINT AT 21,0; PAPER 6; INK
0; FLASH 1;" OUT OF BOUNDS:LOSE
ONE STROKE "
6605 GO SUB 7200
6610 LET s=s+1
6620 LET y=151
6630 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. "s
6635 PAUSE 50
6640 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
"
6645 PRINT AT 21,q(11); PAPER 4;
INK 2;"***"
6650 RETURN
6700 PRINT AT 21,0; PAPER 6; INK
0; FLASH 1;" OUT OF BOUNDS:LOSE
ONE STROKE "
6705 GO SUB 7200
6710 LET s=s+1
6720 LET y=1
6730 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. "s
6735 PAUSE 50
6740 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
"
6745 PRINT AT 21,q(11); PAPER 4;
INK 2;"***"
6750 RETURN
6999 REM ** check hazards sub **
7000 IF q(n)=3 THEN LET w(n)=12
8: LET f(n)=w(n)+23; GO TO 7100
7001 IF q(n)=4 THEN LET w(n)=12
0: LET f(n)=w(n)+23; GO TO 7100
7002 IF q(n)=5 THEN LET w(n)=11
2: LET f(n)=w(n)+23; GO TO 7100
7003 IF q(n)=6 THEN LET w(n)=10
4: LET f(n)=w(n)+23; GO TO 7100
7004 IF q(n)=7 THEN LET w(n)=96
: LET f(n)=w(n)+23; GO TO 7100
7005 IF q(n)=8 THEN LET w(n)=88
: LET f(n)=w(n)+23; GO TO 7100
7006 IF q(n)=9 THEN LET w(n)=80
: LET f(n)=w(n)+23; GO TO 7100
7007 IF q(n)=10 THEN LET w(n)=7
2: LET f(n)=w(n)+23; GO TO 7100
7008 IF q(n)=11 THEN LET w(n)=6
4: LET f(n)=w(n)+23; GO TO 7100
7009 IF q(n)=12 THEN LET w(n)=5
6: LET f(n)=w(n)+23; GO TO 7100
7010 IF q(n)=13 THEN LET w(n)=4
8: LET f(n)=w(n)+23; GO TO 7100
7011 IF q(n)=14 THEN LET w(n)=4
0: LET f(n)=w(n)+23; GO TO 7100
7100 IF n=1 THEN LET ch=8
7105 IF n=2 THEN LET ch=17
7110 IF n=3 THEN LET ch=24
7115 IF n=4 THEN LET ch=1
7120 IF n=5 THEN LET ch=28
7125 IF n=6 THEN LET ch=3
7130 IF n=7 THEN LET ch=7
7135 IF n=8 THEN LET ch=9
7140 IF n=9 THEN LET ch=14
7145 IF n=10 THEN LET ch=16
7150 IF n=11 THEN LET ch=19
7160 RETURN
7199 REM *** beep ***
7200 FOR n=1 TO 3
7205 BEEP .50,-10
7210 BEEP .75,-20
7220 NEXT n
7230 RETURN
7300 FOR n=1 TO 16
7305 BEEP .02,n
7310 NEXT n
7320 RETURN
7999 REM ** hit tree routine **
8000 IF x>=32 AND x<=39 AND y>=1
04 AND y<=111 THEN GO TO 8100
8005 IF x>=88 AND x<=95 AND y>=1
04 AND y<=111 THEN GO TO 8100
8010 IF x>=144 AND x<=151 AND y>
=104 AND y<=111 THEN GO TO 8100
8015 IF x>=208 AND x<=215 AND y>
=104 AND y<=111 THEN GO TO 8100
8020 IF x>=208 AND x<=215 AND y>
=48 AND y<=55 THEN GO TO 8100
8025 IF x>=144 AND x<=151 AND y>
=48 AND y<=55 THEN GO TO 8100
8030 IF x>=88 AND x<=95 AND y>=4
8 AND y<=55 THEN GO TO 8100
8035 IF x>=32 AND x<=39 AND y>=4
8 AND y<=55 THEN GO TO 8100
8040 IF x>=120 AND x<=127 AND y>
=88 AND y<=95 THEN GO TO 8100
8045 IF x>=120 AND x<=127 AND y>
=32 AND y<=39 THEN GO TO 8100
8050 IF x>=128 AND x<=135 AND y>
=80 AND y<=87 THEN GO TO 8100
8055 IF x>=176 AND x<=183 AND y>
=80 AND y<=87 THEN GO TO 8100
8060 GO TO 6005
8100 FOR n=5 TO 10
8105 BEEP .01,n
8110 NEXT n
8120 LET y=y+INT (d/3)
8130 PRINT AT 21,0; PAPER 6; INK
0;" HIT TREE : BALL REBOUNDED
"
8140 PAUSE 50
8150 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
8160 PRINT AT 21,q(11); PAPER 4;
INK 2;"***"
8190 GO TO 160
9099 REM *** golf rules ***
9100 PRINT AT 0,0;" GOLF "
9110 PRINT AT 1,0; PAPER 6; INK
0;"T "; PAPER 7; INK 0;" THE TE
E WILL BE AT THE "
9120 PRINT AT 2,0; PAPER 6; INK
0;" "; PAPER 7; INK 0;" BOTTOM
LEFT OF YOUR SCREEN "
9130 PRINT AT 3,0; PAPER 6; INK
0;" "
9140 CIRCLE 10,156,1
9150 PAUSE 100
9160 PRINT AT 3,1; PAPER 6; INK
2;"^t"; PAPER 7; INK 2;"he ball"
9170 PAUSE 200
9180 PRINT AT 5,0; PAPER 3; INK
2;" ■ "; PAPER 7; INK 0;" THE GR
EEN WILL BE AT A "
9190 PRINT AT 6,0; PAPER 3; INK
0;" o "; PAPER 7;" RANDOM POSITI
ON ON THE "
9200 PRINT AT 7,0; PAPER 3; INK
0;" "; PAPER 7;"
COURSE"
9205 PAUSE 100
9210 PRINT AT 7,1; PAPER 3; INK
2;"^t"; PAPER 7; INK 2;"he hole"
9215 PAUSE 100
9220 PRINT AT 9,0;"YOU DECIDE TH
E STRENGTH AND ANGLE OF YOUR
SHOTS "
9230 PRINT AT 12,0;"AVOIDING THE
HAZARDS"
9235 PAUSE 100
9240 PRINT AT 13,0;"WATER "; PAP

```

```

ER 8; INK 5;"X"; PAPER 7; INK 0;
" LOSES TWO STROKES
9250 PRINT AT 14,0;"BUNKERS "; P
APER 8; INK 6;"X"; PAPER 7; IN
K 0;" LOSE ONE STROKE
9260 PRINT AT 15,0;"WOODS "; PAP
ER 8; INK 2;"X"; PAPER 7; INK
0;" LOSE ONE STROKE
9270 PRINT AT 17,0;"OUT OF BOUND
S LOSES ONE STROKE
9280 PRINT AT 18,0;"THE FENCES #
# AND OTHER TREES DO NOT LOS
E YOU STROKES BUT YOU MAY REBO
UND OFF SOME OF THE TREES."
9290 PRINT INVERSE 1;0;"PRESS
ANY KEY TO CONTINUE"
9300 PAUSE 0
9310 CLS
9320 PRINT AT 0,0;"STRENGTH AND
ANGLE OF SHOT"
9330 PRINT AT 2,0; PAPER 1; INK
7;"STRENGTH"
9340 PAUSE 50; PRINT AT 4,1; PAP
ER 7; INK 0;"10"; CIRCLE 10,132,
1; DRAW 5,0; CIRCLE 15,132,1
9350 PAUSE 50; PRINT AT 6,1; PAP
ER 7; INK 0;"25"; CIRCLE 10,116,
1; DRAW 12,0; CIRCLE 22,116,1
9360 PAUSE 50; PRINT AT 8,1; PAP
ER 7; INK 0;"50"; CIRCLE 10,100,
1; DRAW 25,0; CIRCLE 35,100,1
9370 PAUSE 50; PRINT AT 10,1; PA
PER 7; INK 0;"100"; CIRCLE 10,84
,1; DRAW 50,0; CIRCLE 60,84,1
9380 PAUSE 50; PRINT AT 12,1; PA
PER 7; INK 0;"150"; CIRCLE 10,68
,1; DRAW 75,0; CIRCLE 85,68,1
9390 PAUSE 50; PRINT AT 14,1; PA
PER 7; INK 0;"200"; CIRCLE 10,52
,1; DRAW 100,0; CIRCLE 110,52,1
9400 PRINT AT 17,0;"YOU CAN USE
ANY STRENGTH" 1 TO 200";0; IN
VERSE 1;"PRESS ANY KEY TO CONTIN
UE"
9410 PAUSE 0
9420 CLS : PRINT AT 0,0;"STRENGT
H AND ANGLE OF SHOT"
9430 PRINT AT 2,0; PAPER 2; INK
7;"ANGLE"
9440 PAUSE 50; PLOT 119,96; DRAW
40,0; PRINT AT 10,20;"0"
9450 PAUSE 50; PLOT 119,96; DRAW
32,32; PRINT AT 5,19;"45"
9460 PAUSE 50; PLOT 119,96; DRAW
0,40; PRINT AT 4,14;"90"
9470 PAUSE 50; PLOT 119,96; DRAW
-32,32; PRINT AT 5,9;"135"
9480 PAUSE 50; PLOT 119,96; DRAW
-40,0; PRINT AT 9,7;"180"
9490 PAUSE 50; PLOT 119,96; DRAW
32,-32; PRINT AT 14,18;"-45"
9500 PAUSE 50; PLOT 119,96; DRAW
0,-40; PRINT AT 15,13;"-90"
9510 PAUSE 50; PLOT 119,96; DRAW
-32,-32; PRINT AT 14,9;"-135"
9520 PRINT AT 17,0;"YOU MAY USE
ANY ANGLE 0 TO 180"
9530 PAUSE 100
9540 PLOT 151,96; DRAW -64,0,PI;
DRAW 4,4; DRAW -4,-4; DRAW -4,4
9550 PRINT AT 19,0;"OR 0 TO -179
"
9555 PAUSE 100
9560 PLOT 151,96; DRAW -64,0,-PI
: DRAW -4,-4; DRAW 4,4; DRAW 4,-
4
9570 PRINT INVERSE 1;0;"PRESS
ANY KEY TO CONTINUE"
9580 PAUSE 0
9600 CLS : PRINT AT 0,0; INK 2;"
WARNING"
9610 PRINT AT 2,0;"EXTRA CAUTION
MUST BE TAKEN IF THE GREEN IS
OVER A HAZARD eg:"
9620 PRINT AT 6,14; PAPER 3;"
";AT 7,14; PAPER 3; INK 6;"X";AT
7,15; PAPER 3; INK 0;"O"; PAPER
3; INK 6;"X"
9630 PRINT AT 8,14; PAPER 3;"
"
9640 PRINT AT 10,0;"AS A MISSED
SHOT COULD RESULT IN THE LOSS OF
STROKES"
9650 PRINT AT 13,0;"NOTES""1:A
line will be drawn between each
shot until you land on the gree
n"
9660 PRINT AT 18,0;"2:If you fin
d the hole too small at first you
can widen it by altering the
No's in line 190"
9670 PRINT INVERSE 1;0;"PRESS
ANY KEY TO CONTINUE
"
9680 PAUSE 0
9690 CLS
9695 RETURN
9699 REM ** set up variables **
9700 LET k=0; LET u=0; LET o=0
9710 LET a=0; LET b=0
9720 LET p1=1
9730 LET z=0
9740 LET p=0; LET l=0
9750 DIM t(18)
9760 DIM i(18)
9770 DIM v(18)
9780 DIM q(11)
9790 DIM w(11)
9800 DIM f(11)
9810 DIM e(2)
9820 RETURN
9899 REM *** set up U.D.G's. ***
9900 FOR j=USR "a" TO USR "h"-1
9910 READ a: POKE j,a: NEXT j
9912 RETURN
9915 REM a=
9920 DATA 0,7,15,127,127,127,255
,255
9925 REM b=
9930 DATA 0,197,239,255,255,255,
255,255
9935 REM c=
9940 DATA 0,224,248,254,254,254,
255,255
9945 REM d=
9950 DATA 126,124,120,60,124,124
,62,62
9955 REM e=
9960 DATA 34,254,34,34,34,254,34
,34
9965 REM f=
9970 DATA 0,126,126,126,126,64,6
4,64
9975 REM g=
9980 DATA 24,124,126,124,60,24,2
4,52

```



Sort At Input

by Tom Ithell

Sorting is the most written-about topic in software literature. Reams and reams have been written about chopping a few extra microseconds off a sort time.

When the data to be sorted is typed at a keyboard, the most obvious and frequently overlooked method is to sort at input. During the pause between press-

ing RETURN and the next data item, there's usually sufficient time to place the data item in a sorted array. The impressive aspect of this method of sorting is that a sorted output is immediately available after entering the last item.

The routines were written on a TRS-80 Model 1, although little modification is

needed to run the routines in any dialect of Basic. Listing one is a sort of numbers into ascending order, listing two is a sort of strings into ascending order, and listings three and four show the changes needed to make the sort in descending order.

PROGRAMS

```

1 REM LISTING 1
10 REM NUMBER SORT ON INPUT
20 REM (C) T.A. ITHILL 1984
30 REM USEFUL FOR UP TO 200 NUMBERS
40 REM DELETE REM STATEMENTS FOR FASTEST OPERATION
100 CLS
109 REM SPECIFY READINGS
110 INPUT "STATE NUMBER OF ITEMS TO BE SORTED":NR
119 REM DIMENSION ARRAY
120 DIM ARRAY(NR+1)
129 REM INITIALISE ARRAY(0) WITH LARGE DUMMY NUMBER
130 ARRAY(0)=1000000000000000000
139 REM ZERO ARRAY
140 FOR Z=1 TO NR+1
150 ARRAY(Z)=0
160 NEXT Z
169 REM NUMBER INPUT LOOP
170 FOR LOOP=1 TO NR
180 PRINT LOOP: INPUT "STATE NUMBER":V
189 REM CHECK IF INPUT IS LESS THAN DATA ALREADY IN ARRAY
190 FOR CHECK=0 TO LOOP
200 IF V<ARRAY(CHECK) THEN 220
210 NEXT CHECK
218 REM MOVE ALL EXISTING SORTED NUMBERS FORWARD ONE ARRAY
219 REM ELEMENT TO CREATE SPACE FOR NEW NUMBER
220 FOR MOVE = LOOP TO CHECK STEP-1
230 ARRAY(MOVE+1)=ARRAY(MOVE)
240 NEXT MOVE
249 REM PUT NEW NUMBER INTO THE ARRAY
250 ARRAY(CHECK)=V
260 NEXT LOOP
269 REM PRINTOUT THE SORTED NUMBERS
270 FOR PR=0 TO NR-1
280 PRINT ARRAY(PR):" ";
290 NEXT

1 REM LISTING 2
10 REM STRING SORT ON INPUT
20 REM (C) T.A. ITHILL 1984
30 REM USEFUL FOR UPTO 100 STRING DATA ITEMS
40 REM DELETE REM STATEMENTS FOR FASTEST OPERATION
100 CLEAR 200:CLS
109 REM SPECIFY READINGS
110 INPUT "STATE NUMBER OF STRINGS TO BE SORTED":NR
119 REM DIMENSION ARRAY
120 DIM ARRAY$(NR+1)
129 REM INITIALISE ARRAY$(0) WITH LARGE DUMMY STRING
130 ARRAY$(0)="ZZZZZZZZZZZZZZZZZZZZ"
139 REM ZERO ARRAY
140 FOR Z=1 TO NR+1
150 ARRAY$(Z)=""
160 NEXT Z
169 REM STRING INPUT LOOP
170 FOR LOOP=1 TO NR
180 PRINT LOOP: INPUT "STATE STRING":V$
189 REM CHECK IF INPUT STRING IS LESS THAN DATA ALREADY IN ARRAY
190 FOR CHECK=0 TO LOOP
200 IF V$<ARRAY$(CHECK) THEN 220
210 NEXT CHECK
218 REM MOVE ALL EXISTING SORTED STRINGS FORWARD ONE ARRAY
219 REM ELEMENT TO CREATE SPACE FOR NEW STRING
220 FOR MOVE = LOOP TO CHECK STEP-1
230 ARRAY$(MOVE+1)=ARRAY$(MOVE)
240 NEXT MOVE
249 REM PUT NEW STRING INTO THE ARRAY
250 ARRAY$(CHECK)=V$
260 NEXT LOOP
269 REM PRINTOUT THE SORTED STRINGS
270 FOR PR=0 TO NR-1
280 PRINT ARRAY$(PR)
290 NEXT

1 REM LISTING 3
10 REM NUMBER SORT ON INPUT (DESCENDING ORDER)
1
DELETE LINES 129 AND 130
1
139 REM ZERO ARRAY
140 FOR Z=0 TO NR+1
150 ARRAY(Z)=0
160 NEXT Z
1
189 REM CHECK IF INPUT IS GREATER THAN DATA ALREADY IN ARRAY
190 FOR CHECK=0 TO LOOP
200 IF V>ARRAY(CHECK) THEN 220
210 NEXT CHECK
1 REM LISTING 4

```

PROGRAMS

```

10 REM STRING SORT ON INPUT (DESCENDING ORDER)
|
DELETE LINES 129 AND 130
|
139 REM ZERO ARRAY
140 FOR Z=0 TO NR+1
150 ARRAY$(Z)=" "
160 NEXT Z
|
189 REM CHECK IF INPUT STRING IS GREATER THAN DATA ALREADY IN AR
RAY
190 FOR CHECK=0 TO LOOP
200 IF V$(=) ARRAY$(CHECK) THEN 220
210 NEXT CHECK

```



See Blunders
March 1985 - p175

Commodore 64 Defkeys

by M Hibbet

With this program it's possible to define each of the eight function keys on the Commodore 64 to any string of text up to 60 characters in length. Its obvious use is to define the most commonly-used Basic commands and statements, such as PRINT, POKE, LIST, RUN, and so on. RETURN may be included at the end of the text so that direct commands will be executed immediately. Sixty characters gives plenty of scope to produce more complicated operations, as a number of statements can be linked together using semicolons.

The text for the keys may be defined in two ways: by a direct command, or as a line in Basic. The method of doing this is as follows:

1) By direct command —

n = text

where n is the function key number 1 to 8. To set function key 3 to the text 'PRINT' you type:

3 = PRINT

2) In a Basic line —

REM n = text

In both cases, if RETURN is required at the end of the text, then the last character before the '=' should be a shifted R.

When a key has been defined, whenever the key is pressed its associated text is printed from the current cursor position.

To run the program, type it in and then RUN and SYS 49312. If, for any reason, you want to return the function keys to

their normal operation, this can be done with SYS 49328.

Once the program has been run and loaded into memory, it's convenient to save it to tape as a machine code file. This is done as follows:

```

POKE 44,196:POKE 43,0
POKE 46,195:POKE 45,129
SAVE "DEFKEY MC"

```

It can be loaded back into memory with:

```
LOAD "DEFKEY MC",1,1
```

When loaded type:

```
NEW
```

The machine code must be loaded before any Basic program which uses it.

```

10 FOR A= 49152 TO 49340
20 READ B
30 POKE A,B
40 NEXT
50 FOR A= 49920 TO 50048
60 READ B
70 POKE A,B
80 NEXT
90 FOR A= 49408 TO 49919
100 POKE A,0
110 NEXT
1000 DATA160,0,185,14,192,153,115,0,200,
192,6,208,245,96,32,20,192
1010 DATA32,65,192,32,43,192,201,33,208,
15,32,65,192,32,43,192,141
1020 DATA72,192,32,73,192,32,65,192,96,1
65,122,141,62,192,165,123,141
1030 DATA63,192,238,62,192,208,3,238,63,
192,173,0,8,96,230,122,208
1040 DATA2,230,123,96,234,169,193,141,15
8,192,173,72,192,56,233,49,141
1050 DATA72,192,162,0,41,3,240,12,162,64
.74,240,7,162,192,106,48
1060 DATA2,162,128,142,157,192,173,72,19

```


PROGRAMS

```

2,201,4,48,3,238,158,192,162
1070 DATA0,32,65,192,32,65,192,32,65,192
.32,43,192,201,210,208,2
1080 DATA169,13,201,93,240,8,32,156,192,
232,224,63,208,232,169,0,32
1090 DATA156,192,96,157,0,193,96,32,0,19
2,120,169,5,141,20,3,169
1100 DATA195,141,21,3,88,96,120,169,49,1
41,20,3,169,234,141,21,3
1110 DATA88,96
1120 DATA6,0,2,4,0,8,165,197,205,4,195,2
08,3,76,114,195,201
1130 DATA3,16,8,169,0,141,4,195,76,114,1
95,201,7,16,244,141,4
1140 DATA195,56,233,3,170,189,0,195,24,1
09,141,2,72,162,0,41,3
1150 DATA240,12,162,64,74,240,7,162,192,
106,48,2,162,128,142,84,195
1160 DATA169,193,141,85,195,104,201,4,48
.3,238,85,195,160,0,185,0
1170 DATA193,201,0,240,24,201,13,240,24,
132,254,174,134,2,41,191,32
1180 DATA19,234,32,182,230,164,254,200,1
92,63,208,225,40,76,49,234,141
1190 DATA119,2,169,1,133,198,40,76,49,23
4

```



Space Drop

by A Clark

Be prepared to take on a veritable onslaught of alien ships. They may come at you only one at a time, but each attack is made with renewed vigour. You are in your own ship at ground level and can move back and forth taking pot-shots at the enemy space ship. It's kill or be killed — you must shoot down your adversary before it reaches you.

The title screen adds an original touch

and demonstrates to good effect the Commodore 64's keyboard graphic capabilities. It doesn't use redefined characters — they are all accessible from the keyboard. A TV screen flicks through the various channels until it reaches what is on the Commodore 64 tonight.

After the title page you go straight into the game. Use a joystick in control port one to fire down a level one alien. A hit

summons a level two alien to move into attack. And so on until the alien contingent overwhelms you and your level and score are displayed along with the highest level reached and the highest score.

There is no high-score table but this could easily be included between lines 640 and 699.

```

0 REM*** S*P*A*C*E**D*R*O*P ***
1 REM*** BY ANDY CLARKE 1984 ***
2 REM*****
3 PRINT"LCLEAR":POKE53280,0:POKE53281,0
4 GOSUB330:FOR$=200TO205:FOR$=0TO62
5 READA:POKE$*64+T,A:NEXT
6 FOR$=0TO62:POKE206*64+T,0:NEXT
7 FOR$=0TO62:POKE207*64+T,0:IFT=00RT=30R
T=60RT=90THENPOKE207*64+T,4
8 IFT=20RT=50RT=80RT=11THENPOKE207*64+T,
32
9 NEXT:GOSUB100:HS=0:BL=0
10 FL=3:SC=0:HL=0
11 LE=0:PRINT"LCLEAR":V=53248:GOSUB620:
GOSUB500
12 IFFL<0THEN650
13 POKE2040,200:POKE2041,201
14 POKE2042,207:POKEV,150:POKEV+1,230
15 GOSUB600:POKEV+41,1
16 POKEV+39,6:POKEV+40,15
17 POKEV+28,2:POKEV+38,10:POKEV+37,6
18 POKEV+21,3:POKEV+30,0:X1=150:W=3
19 JS=PEEK156321
20 IFT=247THENX1=X1+10
21 IFT=251THENX1=X1-10
22 IFT=255THENX1=255
23 IFT=259THENX1=30
24 IFT=239ORJS=235ORJS=231THENGOSUB200
25 X2=X2+W:IFT=250ORX2<=30THENW=-W:Y2=
Y2+10
26 IFT=255THENX2=255
27 IFT=230THENX2=30
28 IFT=220THENFL=FL-1:GOSUB520:GOTO640
29 POKEV,X1:POKEV+2,X2:POKEV+3,Y2:GOTO30
30 PRINT"LCLEAR":LF=54272:FOR$=1234TO1
251
31 POKE$,224:POKE$+360,224:POKE$+LF,9:P
OKE$+360+LF,9:NEXT
32 FOR$=1274TO1554STEP40:POKE$,224:POKE
$+LF,224
33 POKE$+LF,9:POKE$+17+LF,9:NEXT
34 FOR$=1276TO1286:POKE$,67:POKE$+280,6
7:POKE$+LF,14:POKE$+280+LF,14:NEXT
35 FOR$=1315TO1515STEP40:POKE$,66:POKE
$+12,66:POKE$+LF,14:POKE$+12+LF,14:NEXT
36 POKE1275,85:POKE1287,73:POKE1555,74:
POKE1567,75
37 POKE1275+LF,14:POKE1287+LF,14:POKE15
55+LF,14:POKE1567+LF,14
38 FOR$=1329TO1449STEP40:POKE$,87:POKE
$+LF,2:NEXT

```

PROGRAMS

[illegible]

PROGRAMS

```

BEST LEVEL:*
632 PRINT:[HOME][DOWN][DOWN][DOWN][DOWN]
[DOWN][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT]
[RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RIG
HT][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT]
[RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RI
GHT][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT]
[RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RIGH
T][YELLOW]*IHL:RETURN
640 IFLE)HLENH=LE
642 POKEV+21,3:GOTO11
650 POKEV+21,1:PRINT"[CLEAR]"
652 PRINT:[HOME][DOWN][DOWN][DOWN][DOWN]
[RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][W
HITE]GAME OVER"
654 PRINT:[DOWN][DOWN][RIGHT][RIGHT][RIGHT][RIG
HT][RIGHT][RIGHT][YELLOW]SCORE[WHITE]*IS
C
656 PRINT:[DOWN][RIGHT][RIGHT][RIGHT][RIG
HT][RIGHT][YELLOW]BEST LEVEL[WHITE]*IHL
657 POKEVO,0:IFSC)HSTHENNS=SC
658 PRINT:[DOWN][RIGHT][RIGHT][RIGHT][RIGHT][RIG
HT][RIGHT][YELLOW]BEST SCORE[WHITE]*IHS
659 IFHL)BLTHENBL=HL:PRINT"[DOWN][RIGHT]
[PIGHT][RIGHT][RIGHT][RIGHT][RIGHT][WELL DONE!!"
*
660 PRINT:[DOWN][RIGHT][RIGHT][RIGHT][RIG
HT][RIGHT][YELLOW]BEST EVER LEVEL[WHITE]
1*IHL
662 PRINT:[DOWN][DOWN][DOWN][RIGHT][RIGHT]
[RIGHT][RIGHT][RIGHT][RIGHT]c 3)ANOTHER GO?"
664 PRINT:[DOWN][RIGHT][RIGHT][RIGHT][RIGHT][RIG
HT][RIGHT][RIGHT]c 6)MOVE STICK FOR [WHITE]NO
"
666 PRINT:[RIGHT][RIGHT][RIGHT][RIGHT][RIG
HT]c 6)PRESS FIRE FOR [WHITE]YES"
668 JS=PEEK(56321):IFJS=239THEN674
670 IFJS<>255THENSYS64738
672 GOTO668
674 FORT=1TO200:NEXT:PRINT"[DOWN][RIGHT]
[RIGHT][RIGHT][RIGHT][RIGHT][WHITE]VIEW
TILES?"
676 PRINT:[DOWN][RIGHT][RIGHT][RIGHT][RIG
HT][RIGHT][RIGHT]c 6)MOVE STICK FOR [WHITE]NO
"
678 PRINT:[RIGHT][RIGHT][RIGHT][RIGHT][RIG
HT]c 6)PRESS FIRE FOR [WHITE]YES"
680 JS=PEEK(56321):IFJS=239THENPOKEV+21,
0:GOSUB330:GOSUB100:GOTO10
682 IFJS<>255THEN10
684 GOTO680
30000 REM*****LAUNCHER
30001 DATA4,56,64,4,124,64,4
30002 DATA108,64,4,238,64,7,239
30003 DATA192,4,238,64,4,238,64
30004 DATA0,238,0,0,238,0,0
30005 DATA238,0,0,238,0,65,239
30006 DATA4,65,109,4,71,109,196
30007 DATA71,109,196,79,125,228,95
30008 DATA125,244,125,171,124,253,125
30009 DATA126,221,69,118,213,1,86
30010 REM*****ALIEN #1
30011 DATA0,0,0,0,0,0,0
30012 DATA0,0,128,0,8,32,0
30013 DATA32,8,0,128,1,85,0
30014 DATA7,253,64,31,255,208,85
30015 DATA85,84,102,102,100,85,85
30016 DATA84,31,255,208,7,255,64
30017 DATA1,85,0,0,0,0,0
30018 DATA0,0,0,0,0,0,0
30019 DATA0,0,0,0,0,0,0
30020 REM*****ALIEN #2
30021 DATA0,0,0,0,0,0,0
30022 DATA0,0,0,0,0,32,0
30023 DATA32,8,0,128,2,2,0
30024 DATA1,85,0,5,85,64,21
30025 DATA253,80,22,170,80,21,253
30026 DATA80,21,85,80,1,85,0
30027 DATA0,0,0,0,0,0,0
30028 DATA0,0,0,0,0,0,0
30029 DATA0,0,0,0,0,0,0
30030 REM*****ALIEN #3
30031 DATA0,0,0,0,0,0,0
30032 DATA0,0,0,0,0,0,0
30033 DATA0,8,0,128,2,2,0
30034 DATA0,136,0,1,85,0,5
30035 DATA85,64,5,253,64,5,85
30036 DATA64,1,85,0,0,0,0
30037 DATA0,0,0,0,0,0,0
30038 DATA0,0,0,0,0,0,0
30039 DATA0,0,0,0,0,0,0
30040 REM*****ALIEN #4
30041 DATA0,0,0,0,0,0,0
30042 DATA0,0,0,0,0,0,0
30043 DATA0,0,0,0,2,2,0
30044 DATA0,136,0,0,32,0,0
30045 DATA84,0,1,117,0,0,84
30046 DATA0,0,0,0,0,0,0
30047 DATA0,0,0,0,0,0,0
30048 DATA0,0,0,0,0,0,0
30049 DATA0,0,0,0,0,0,0
30050 REM*****ALIEN #5
30051 DATA0,0,0,0,0,0,0
30052 DATA0,0,0,0,0,0,0
30053 DATA0,0,0,0,0,0,0
30054 DATA0,0,0,0,136,0,0
30055 DATA32,0,0,84,0,0,0
30056 DATA0,0,0,0,0,0,0
30057 DATA0,0,0,0,0,0,0
30058 DATA0,0,0,0,0,0,0
30059 DATA0,0,0,0,0,0,0

```



by R Keeble

Commodore 64 graphics programming can exploit rasters — the rows of dots that make up a TV screen — to produce interrupts. In this way, the screen can be split in two, with a different graphics mode in each half. An example would be a high-resolution graph with explanatory notes underneath.

Because the picture on screen is redrawn around 60 times per second, interrupts must be handled by machine code routines.

There are four registers which concern us here:

- 1 Raster compare register at 53266 (\$D012)
- 2 Raster compare register bit 8 at 53265 (\$D011)
- 3 Interrupt enable register at 53274 (\$D01A)
- 4 Interrupt status register at 53273 (\$D019)

The raster compare register has two

functions. If it is read, the exact location of the raster is obtained. If written to, an interrupt is forced when the raster reaches that position.

For an interrupt to occur, the Interrupt enable register must be set to a 1. Finally, when an interrupt occurs, the interrupt status register is affected. If caused by the raster, bit 0 is set to a 1.

Two listings are provided here, one in Basic and one in Assembly language. If using an assembler, lines 10-40 and 200-250 can be omitted from the Basic program.

When run, the program places multi-coloured blocks on the top half of the screen, with text underneath. This may not sound too exciting, but provides the rudiments of more advanced techniques as found in *The Hulk*.

The Basic program is self-explanatory, but I shall deal with the machine code in sections.

SE1	
LDAIM	29
STA	788
LDAIM	192
STA	789

This first part relocates the address for interrupt handling routines. The address is stored in 788 (LSB) and 789 (MSB). When the 64 is first switched on, these registers contain the address 59953.

Raster blaster

If an interrupt occurs while this address is being changed, the computer would probably 'lock up'. For this reason, the routine starts with SEI — set interrupt disable.

LDA	53265
ANDIM	127
STA	53265
LDA	53274
ORAIM	1
STA	53274

PROGRAMS

Here, 'bit 8' of the raster compare is set to a 0, so all values fall within the range 0 to 255 (the screen is from 51 to 251 /e 25 rows). The interrupt enable register is set to ON.

CLI

RTS

Having changed the vectors and prepared for the new interrupt routine, interrupts can be enabled again (CLI). The program is exited with the RTS.

Now onto the new routine:

```
LDAIM 1
BIT 53273
BNE 3
JMP 59953
```

Interrupts can also be caused by sprite collisions and light pens, so this part of the program checks that the flag was set by the raster compare IRQ, using the BIT instruction. If the raster didn't cause the interrupt, the usual interrupt routine must be used. (This resides at

59953).

```
LDA 53266
CMPIM 252
BCS 21
```

Now it's certain the raster caused the interrupt, the next step is to determine its position on screen. If less than 252, the raster is in the text area, and carries on to the following set of instructions:

```
LDAIM 252
STA 53266
LDA 53270
AND IM 239
STA 53270
LDAIM 6
STA 53281
JMP 49237
```

A new raster compare value is placed into the register at 53266, and the multi-colour mode is set to OFF. The background will be blue.

```
LDAIM 126
STA 53266
```

```
LDA 53270
ORAIM 16
STA 53270
LDAIM 14
STA 53281
```

This does the opposite to the previous section, turning ON the multi-colour and setting a new interrupt for the middle of the screen. The background colour is switched to a more sombre grey.

Ready to go

The last section of code is the same as that found in the normal interrupt handling routine. It clears the raster IRQ flag by writing a 1 to it, and restores the Accumulator and X and Y registers to the values held before the interrupt occurred.

Control is returned to the program via the RTI instruction.

```
10 FOR N = 1 TO 96 : REM POKE MACHINE CODE
20 READ SPLIT : REM INTO MEMORY
30 POKE 49151+N,SPLIT : REM STARTING AT 49152
40 NEXT N
50 PRINT"[CLR]"
60 PRINT"A DEMONSTRATION OF SPLIT SCREEN GRAPHICS"
70 PRINT"[DOWN][DOWN][DOWN][DOWN][DOWN][DOWN][DOWN][DOWN]"
80 PRINT"A DEMONSTRATION OF SPLIT SCREEN GRAPHICS"
90 POKE 53282,1 : REM BACKGROUND COLOUR 2,WHITE
100 POKE 53283,2 : REM BACKGROUND COLOUR 3, RED
120 SYS49152 : REM SPLIT THE SCREEN
130 END
200 DATA 120,169,29,141,20,3,169,192,141,21,3,173,17,208,41,127
210 DATA 141,17,208,173,26,208,9,1,141,26,208,88,96,169,1,44
220 DATA 25,208,208,3,76,49,234,173,18,208,201,252,176,21,169,252
230 DATA 141,18,208,173,22,208,41,239,141,22,208,169,6,141,33,208
240 DATA 76,85,192,169,130,141,18,208,173,22,208,9,16,141,22,208
250 DATA 169,14,141,33,208,169,1,141,25,208,104,168,104,170,104,64
```

ADDRESS	MACHINE	ASSEMBLY CODE
DECML HEX	CODE	PROGRAM
000000000000	000000000000	0000000000000000
49152 C000	78	SEI
49153 C001	A9 1D	LDAIM 29
49155 C003	8D 14 03	STA 788
49158 C006	A9 C0	LDAIM 192
49160 C008	8D 15 03	STA 789
49163 C00B	AD 11 D0	LDA 53265
49166 C00E	29 7F	ANDIM 127
49168 C010	8D 11 D0	STA 53265
49171 C013	AD 1A D0	LDA 53274
49174 C016	09 01	ORAIM 1
49176 C018	8D 1A D0	STA 53274
49179 C01B	58	CLI
49180 C01C	60	RTS
49181 C01D	A9 01	LDAIM 1
49183 C01F	2C 19 D0	BIT 53273
49186 C022	D0 03	BNE 3
49188 C024	4C 31 EA	JMP 59953
49191 C027	AD 12 D0	LDA 53266
49194 C02A	C9 FC	CMPIM 252
49196 C02C	B0 15	BCS 21

PROGRAMS

49198	C02E	]	A9	FC	]	LDAIM	252
49200	C030	]	8D	12 D0	]	STA	53266
49203	C033	]	AD	16 D0	]	LDA	53270
49206	C036	]	29	EF	]	ANDIM	239
49208	C038	]	8D	16 D0	]	STA	53270
49211	C03B	]	A9	06	]	LDAIM	6
49213	C03D	]	8D	21 D0	]	STA	53281
49216	C040	]	4C	55 C0	]	JMP	49237
49219	C043	]	A9	7E	]	LDAIM	126
49221	C045	]	8D	12 D0	]	STA	53266
49224	C048	]	AD	16 D0	]	LDA	53270
49227	C04B	]	09	10	]	ORAIM	16
49229	C04D	]	8D	16 D0	]	STA	53270
49232	C050	]	A9	0E	]	LDAIM	14
49234	C052	]	8D	21 D0	]	STA	53281
49237	C055	]	A9	01	]	LDAIM	1
49239	C057	]	8D	19 D0	]	STA	53273
49242	C05A	]	68		]	PLA	
49243	C05B	]	A8		]	TAY	
49244	C05C	]	68		]	PLA	
49245	C05D	]	AA		]	TAX	
49246	C05E	]	68		]	PLA	
49247	C05F	]	40		]	RTI	
#####1#####1#####							

by P Leon

the keyboard, the changes you will need are at the end of the program listing. These are the keys you would use if you use the keyboard.

```

100 REM *****
110 REM * SKETCHER *
120 REM *BY PAUL LEON*
130 REM *AUGUST 1984*
140 REM *****
200 REM
220 GOTO 1000
300 MODE(1):X=64:Y=32:COLOR2,0
305 A=127:B=63
310 RESET(X,Y)
320 K$=INKEY$:I$=INKEY$
330 Ix=VAL(I$)
340 IF Ix>0ANDIx<5THEN COLORIx
345 GOSUB 3000
350 Ax=INP(46)AND31
360 IF Ax<>31,400
370 FORZ=1TO40:NEXT:SET(X,Y):FORZ=1TO40:

```

PROGRAMS

```
NEXT:GOTO310
400 IFAZ=30ANDY>0,Y=Y-1 'UP
410 IFAZ=29ANDY<0,Y=Y+1 'DOWN
420 IFAZ=27ANDX>0,X=X-1 'LEFT
430 IFAZ=23ANDX<0,X=X+1 'RIGHT
440 IFAZ=14ANDY>0,SET(X,Y):Y=Y-1
450 IFAZ=13ANDY<0,SET(X,Y):Y=Y+1
460 IFAZ=11ANDX>0,SET(X,Y):X=X-1
470 IFAZ=7ANDX<0,SET(X,Y):X=X+1
480 IFAZ=7ANDX<0,SET(X,Y):X=X+1
500 GOTO 310

1000 REM *** INSTRUCTIONS ***
1030 CLS
1060 PRINT@165,"INSTRUCTIONS (Y/N)"
1070 K$=INKEY$:A$=INKEY$
1080 IFA$="N",300ELSEIFA$="Y",1100
1090 GOTO 1070
1100 CLS:PRINT@6,"*** INSTRUCTIONS ***"
1110 PRINT@65,"USE THE RIGHT JOYSTICK"
1120 PRINT@129,"TO DRAW HOLD THE FIRE BU
TTON"
1130 PRINT@161,"DOWN AND PUSH THE JOYSTI
CK IN"
1140 PRINT@193,"THE REQUIRED DIRECTION."
1150 PRINT@257,"TO MOVE WITHOUT DRAWING
OR TO"
1160 PRINT@289,"RUBOUT, JUST PUSH THE JO
YSTICK"
1170 PRINT@321,"IN THE REQUIRED DIRECTIO
N."

1180 GOSUB 2000
1190 CLS:PRINT@8,"*** COMMANDS ***"
1200 PRINT@65,"C - CLEARS SCREEN AND PLA
CES"
1210 PRINT@101,"CURSOR IN THE CENTRE."
1220 PRINT@161,"E - WILL END THIS PROGRA
M."
1230 PRINT@225,"P - WILL PRODUCE A COPY
OF"
1240 PRINT@261,"THE SCREEN IF A SUITABLE
"
1250 PRINT@293,"PRINTER IS ATTACHED."
1260 PRINT@325,"E.G. SEIKOSHA GP-100/A"
1270 GOSUB 2000
```


PROGRAMS

```

1280 CLS:PRINT8,"*** COLOURS ***"
1290 PRINT65,"TO CHANGE COLOUR WHILE DR
AWING"
1300 PRINT97,"JUST PRESS 1, 2, 3, OR 4,
"
1310 PRINT193,"1 = GREEN":PRINT209,"2
= YELLOW"
1320 PRINT225,"3 = BLUE":PRINT241,"4 =
RED"
1330 PRINT321,"NOTE: COLOUR 1 (GREEN) I
S THE"
1340 PRINT353,"SAME AS THE BACKGROUND C
OLOUR."
1380 GOSUB 2000
1390 GOTO 1000
2000 PRINT449,"PRESS <C> TO CONTINUE"
2010 K$=INKEY$:A$=INKEY$
2020 IF A$<"C",2010
2030 RETURN
3000 K$=INKEY$
3010 A$=INKEY$
3020 IF A$="" RETURN
3025 IF A$<"P" AND A$<"E" AND A$<"C"
RETURN

```

```

3030 IF A$="P" COPY:RETURN
3040 IF A$="E" END
3050 IF A$="C" RUN300
3060 RETURN

```

CHANGES NEEDED TO USE THE KEYBOARD

```

350 A$=INKEY$:A$=INKEY$
360 IF A$<"",400

```

```

400 IF A$="W"ANDY<0,Y=Y-1,UP
410 IF A$="Z"ANDY<B,Y=Y+1,DOWN
420 IF A$="A"ANDX>0,X=X-1,LEFT
430 IF A$="S"ANDX<A,X=X+1,RIGHT
440 IF A$="U"ANDY>0,SET(X,Y):Y=Y-1
450 IF A$="N"ANDY<B,SET(X,Y):Y=Y+1
460 IF A$="H"ANDX>0,SET(X,Y):X=X-1
470 IF A$="J"ANDX<A,SET(X,Y):X=X+1

```

BACK ISSUES

This Back Issues listing has been updated to include all of the available 1984 issues of APC. An order form is included at the end of the listing. Please allow up to four weeks for delivery.

Volume 1 No 6, 1980
 Benchtests: Commodore 8032, SuperBrain/Overview of chess machines and micro programs/ Writing machine independent Basic programs/Printer review/ Programs: Lunar Lander (TRS-80), PET Fighter Pilot, Apple Plotting, LPrint to Print utility (TRS-80), ZX80 Breakout, Graph (TRS-80).



Volume 2 No 3, 1981
 Checkout: Sinclair ZX81/APC-80: Recovering lost programs, JUMP command (allows a GOTO "numeric expression")/ Building a Bigboard/Keystroke reduction for EDTASM users/ Sanders Printer reviewed/Profile of BS Microcomp/CP/M explained by Rodney Zaks/The rapid bubble sort for the Apple/ Encryption for any Microsoft Basic/An imagined 6502 "Dream Machine" specs/Vectors explained on the Challenger IP/ Programs: TRS-80 flashing cursor and non-destructive backspace, Treasure Hunt (PET)

Volume 2 No 4, 1981
 Benchtest: VIC-20, Tandy TRS-80 III/TRS-80 Monitor software compared/Computer Games: Backgammon on micros/Tree access routines explained/Gateways to Logic, Part 8: Penpherals/How Computers Communicate, Part 1: What is I/O/ Profile Gary Blom of the Computer Company/Part 1 of 2: Defining program specification needs/6502 Assembler in Basic/ Wordpower wordprocessor program for the PET/Programs: PET Arithmetic Test, Apple Mondrian.

Volume 3 No 1, 1982
 Benchtest: Tandy TRS-80 Color/ Checkouts: Hitachi Peach, Sharp's Microtranslator, BBC Proton/Profile of Rodney Zaks/ Sorting alphanumeric codes from disk to disk/Computer games:GO-MOKU on micros/ Generating Patterns with a computer, Part 3: The parallel interface/Review of Forth Language/A neat way to describe programs quickly and logically/ Speech Synthesis for the TRS-80s, System 80s, Part 1/Cassette

utility for System 80 on Eprom/ An easy route to shape tables for the Apple/Rubik Cube Simulation for the Apple/How to implement "Turtle" graphics on an Apple/Programs: Get Simulation (Apple), Bug Bug (TRS-80), Cryptography (Microsoft Basic).

Volume 3 No 2, 1982
 Checkout: Apple III/Fitting a smooth curve to complex data plots/Speech synthesis for TRS-80s, System 80s, Part 2/"Bridge" on micros/Relocating assembly language programs/Binary sort explained/Programmable rhythm generator project for PET/Large number calculations on micros/ Basic interpreters explained/ Checkout: ZX81 printer/APC-80 overview and debounce routine/Storing arrays on tape/ Frames of Reference, Part 1: A DP manager's guide to micros/ How Computers Communicate, Part 4: The IEEE interface/ Overview of micro-computer databases/Programs: TRS-80 Alien Seabattle.

Volume 3 No 3, 1982
 Benchtest: Hewlett Packard HP-125/WP Benchtest: Scriptit 2.0/ Checkout: Dick Smith Votrax Type 'N' Talk, The Australian Beginning/Videotext overview/ Frames of Reference, Part 2: Hardware and Software Suppliers/Profile: Jim Warren of the West Coast Computer Faire/How Computers Communicate Part 5: The BCD Interface/Installing hires on the TRS-80/Bridge playing program reviewed/Programs: Galacti-Cube (3D Maze in fairly "standard" Basic), PET Fantasy, ZX80 Labyrinth, PET Juggle.



Volume 3 No 4, 1982
 Benchtests: Osborne 01, Micro Bee/APC-80: Command mode syntax error recovery/How Computers Communicate Part 6: The RS232 interface/80 x 24 display controller project/Preview of the Commodore 64/Atari 400 games reviewed/Profile: Adam Osborne/ANS Basic's features/Solving the hidden surface problem in 3D graphics/Frames of Reference,

Part 3: Micros in mainframe company/Hewlett Packard's networking capability/Programs: TRS-80 Reaction Timing, ZX81 Graphplot, PET Cheese, Superboard Spin-Fighter, TRS-80 Extra.

Volume 3 No 5, 1982
 Benchtests: Texas Instruments TI 99/4A, Xerox 820/Database Benchtest: FMS-80/TRS-80 Model 1 games reviewed/Frames of Reference, Part 4: Software standards/How Computers Communicate, Part 7: Interrupts in micro systems/How to use 3D graphics/Equation solving program/80 x 24 display controller project, Part 2/"Logo" Overview/ Printer survey/Casio's calculator printer/Programs: TRS-80 Double Precision Maths and Trig, Apple 3D Maze, Atari Sums for Kids, Apple Air Flight.

Volume 3 No 6, 1982
 Benchtests: Sinclair ZX Spectrum, Sirius I/Database Benchtest: dBase II/7th West Coast (micro-computer Faire)/ Checkout: F-10 Daisywheel printer, Arlon Expandboard/ How Computers Communicate, Part 8: Direct memory access/ Frames of Reference, Part 5: Buying micro hardware in a DP department/Self learning program/80 x 24 display controller project, Part 3 (end)/How to get more on Apple disks/Lisp — an artificial intelligence language/ VIC-20 games reviewed/Implementing CP/M system calls from Microsoft Basic/APC Subset (first on new monthly column for assembler language routines)/ Programs: TRS-80 Invader, PET Mini-animate, VIC-20 Trailblazer, ZX81 Book Index, Weebie Monitor (TRS-80), VIC-20 Large Characters.

Volume 3 No 7, 1982
 Benchtests: Sharp MZ80B, Monroe OC 8820/Checkout: Sharp PC1500, The Micro Professor/Apple II games reviewed/APC-80: Various PEEKs and POKEs explained/ Reversing images on computer screens/Frames of Reference, Part 6: Putting your micro to work/How Computers Communicate, Part 9: Character codes/Educational arcade-type game/Programs: ZX81 Hypocycloids, TRS-80 Truth, PET Doc, TRS-80 Screen Dump, PET Boxes, Atari Earth.

Volume 3, No 9, 1982
 Benchtest: ICL Personal Computer/Checkout: E40/CP/M data compression utility/ Daisywriter printer, HP 11C & 120 calculators/BBC micro graphics capability/Best of APC's cartoons/ How to use Benchmarks/Logo Program (Microsoft Basic) Computer generated textures/RS232 overview, Part 2/Memory-saving utility for Apple/How Computers Communicate, Part 11: Interrupts and buffers/Programs: System 80 Extended Basic, Apple Trees, ZX81 Alphabetising, PET File Companion, PET German Game.

Volume 3 No 10, 1982
 Benchtests: Hewlett Packard HP-86, National Panasonic JB3000/ Checkout: Sharp PC-1211/UCSD p-System overview, Part 3 (end)/ How to implement 3D graphics on a micro/CP/M-86 vs MS-DOS: Relative merits of these 16-bit operating systems discussed/ Designing your own database/ Monitor for TRS-80/System 80/ File searching method/"Laws of Form" — a novel form of logic/ How Computers Communicate, Part 12 (end)/Benchmarking high level languages/Programs: TRS-80 Cardshuffler, PET Knockout, PET Trains.

Volume 3 No 11, 1982
 Benchtests: Hewlett Packard HP75C, Kaypro II, DEC Rainbow/Programs for the HP41C and Casio fx702p/Algebra checking program/More on MS-DOS vs CP/M-86/Predictions in the micro industry/Clock/calendar card for the Apple II, Part 1/Benchmarks summary/ Programs: Apple II Piano Computer, Moon Module (Apple II, correction in Vol 4 No 1), Walls (Atari, correction in Vol 3 No 12).

Volume 4 No 2, 1983
 Benchtests: Sharp PC1251/Database Benchtest: Hi Data/Micros as best friends/A major boost to the standards of 'user friendliness'/Computing can be a health hazard/Expert Systems' — part two: appraisal of 'intelligent' computers/Networks: Part 1/The Logo Turtle checked-out/Getting the most from the BBC's graphics/Are home computers just a passing fad/ The Prestige vs The human:

micro chess/Programs: Apple Character Plotter, System Tape Copier (TRS-80/System 80).

Volume 4 No 6, 1983
 Benchtest: Texas Instruments Professional/Checkouts: Comx 35 home computer, NEC's Spinwriter daisywheel printer/ Multi-Tool Word wordprocessor from Microsoft/Occam Occult futuristic new language/The world of creative cross-figures/ MicroBee games reviewed/Are micros a good idea/Programs: Construction Worker (System 80, TRS-80), Chicken Little (MicroBee), PET Zombies, Spectrum Blaster, Commodore 64 Sprite editor.



Volume 4 No 8, 1983
 Benchtests: Apple Lisa, DOT/ Checkouts: Osborne Executive, Epson FX-80 printer/Consumer Electronics Show Report/Will the Computer be the next dominant species on Earth/Milton Bradley's chess computer that moves its own pieces/Choosing suitable disks for your computer/ Cryptography on a micro/ Warner Orr structured programming, Part 1/How to use the six function keys on the PC1500/ Programs: ZX81 Least Squares, System 80 Loading tapes from an external cassette player, TRS-80/ System 80 Adventure program, Apple II Pascal menu generation.

Volume 4 No 9, 1983
 Benchtests: Sord M5/Checkout: Tandy Model 100, Lisawrite/ Screenplay: TI 99/4A games/

BACK ISSUES

Steve Wozniak returns to Apple/Choosing a home micro/Warrior Orr programming, Part 2/Graph plotting and curve fitting on the BBC Computer/Bemoaning the mechanical teller/Programs: VIC-20 Snake line, ZX81 Surround, Apple II Screenplay, PET Histogram.

Volume 4 No. 10, 1983
Benchtest: Archives PC/Home Computer Survey — 15 micros selling for less than \$1000 checked out by Steve Withers in an exhaustive market survey/Checkout: Simons Basic, T/Maker III — office tool for the IBM PC, Digital Research Personal Basic/Computerising Your Business — a light and practical guide/Beginners Guide to Basic Program Conversion/Clever trick with TI Sprites/Cocktail program/Warrior Orr programming, Part III/How portable is portable/Programs: Atari No-Trons, TRS-80/System 80 Multi-Maths, Apple Text Maker, VIC 20 Spider.

Volume 4 No. 11, 1983
Benchtest: Apricot/Checkouts: Atari 600XL, Ashton Tate's Financial Planner, Condor database, Atari Writer/Which Spreadsheet? PerfectCalc/Profiles: Clive Sinclair, Nolan Bushnell/Set up your own computer learning centre/Basic Converter Chart/Warrior Orr Programming Part 4: Techniques (end)/Programs: PET Wave Simulation, Apple II Aplist, Microsoft Basic Calendars, TI99/4A Breakout, Commodore Testing Your Fingers, Apple Dotter Puzzle, VIC-20 Starship, Commodore Maths Test.

Volume 4 No. 12, 1983
Benchtest: TANDY MC-10/Checkout: Executive 816, Lotus 1-2-3, VisiOn, Gemini 15X Printer/Computerising Your Business: Part 2, Setting up/Sort Trees for beginners/Printing big on an Epson printer/Bulletin boards/Programs: VIC-20 Robotank, VZ-200 Missile Command, New 'Bee Screen, MicroBee Grobble Grab, Apple French Test Card, TRS-80 Road Rally.

Volume 5 No. 1, 1984
Benchtest: NEC PC-8201A/Checkouts: Coleco Adam, Kaypro 10, Atari Paint, Desq/Micro music — how it's done: Part 1/"Check Digits" — methods of ensuring correct data entry/building models using surfaces, not lines/Column sort algorithm/Programs on Tandy's Co Co/Spectrum listing: photofit/Locking Apple Listings/Programs: Commodore 64 Fast Sprites, IBM PC Sheepdog Trials, VIC 20 Variable List/Spectrum Lower CLS, Commodore 64 Monitor, Oric City Defense, MicroBee Tunes.

Volume 5 No. 2, 1984
Benchtest: Workslate, Commodore 720/Checkouts: Visual, Sord's Falc, '64 Vizawrite, Brainstorm/DIY Apple Interface/TRS-80 Disassembler/Benchmark summary to-date/Basic Program Conversion, Part 2 (Part 1 in Vol 4 No. 11)/BBC Music, Part 1/Could speech synthesizers do long term damage to the language/Programs: TRS-80 Pascal Procedures, PET Maths Maze, BBC Logic Tree, VIC 20 Grid Bike, '64 Heli-bomber, '64 Battlestar Fighter, Apple Bridge Builder.

Volume 5 No. 3, 1984
Benchtest: IBM PC Junior, Sharp MZ-700/Checkouts: Androbof's Topo, Homewood word processor, TKISolver, Educational Games/Basic Program Conversion, Part 3: Apple II graphics/Atari memory (for patterns of colour and sound) tester/Teach Yourself Assembler, Part 1/BBC Music, Part 2/View of the future from the author of VisiCalc/Give your program cassettes a spoken index/Programs: Apple Stargo, PET Areas, Spectrum Jackpot, Atari Split-screen, TRS-80 Sound Synthesiser, 3D 'Bee, '64 Sprite Designer.

Volume 5 No. 4, 1984
Benchtest: Macintosh, Spectravideo/Checkouts: IBM Portable PC, Unix, Visiword Plus, Spectravideo/Teach Yourself Assembler, Part 2/Basic Program Conversion, Part 4: TRS-80 and Apple II graphics/Sharp PC1500 game scoring listing/Interview: Bill Gates of Microsoft/Microchess: 4th World Chess Championship results/Inside Atari's research laboratory/Programs: Microsoft Basic Inlay Cards, BBC Splash!, VIC 20 Invaders, Commodore 64 Reversi, VZ-200 Moon Lander, '64 Gary the Guitur.

Volume 5 No. 5, 1984
Benchtest: Hewlett Packard 150 Touch Screen, Dick Smith Challenger, Canon X-07/Checkouts: Revelation, Concurrent CP/M, StarBurst and StarIndex, Sendata modem, Commodore SFD 1001 disk drive, Brother EP44 personal typewriter/Basic Program Conversion, Part 5: Atari/Compaction techniques, examples in Commodore Basic/Teach Yourself Assembler, Part 3/Text vs Graphics adventures/Operating Systems, Part 1/Microchess: Superstar vs Constellation/Programs: '64 Plane Attack, Commodore Wordsquare, Atari Flash Simulator, Atari Pseudo-Dos, Sord MS Chappatt, VIC 20 Ape King, MicroBee Hires Editor, Apple II Oisterads, 'Bee Label Printer.

Volume 5 No. 6, 1984
Benchtest: Sharp PC5000/Checkouts: Codewriter, Microsoft Word, Dick Smith Cat, Apple ProDos, KnowledgeMan, Autocad/Play Battleships on two Commodore computers/The History of the Keyboard/Teach Yourself Assembler, Part 4/Artificial Intelligence: a report from Japan/Basic Program Conversion, Part 6: Spectrum/Spectrum "wide screen" word processing/Software Copyright: the debate/The dangers of reviewing software/Programs: TRS-80 Compiler, TRS-80 Braille Writer, VIC 20 Deathwall, Basic-86 Marvin, PET 3D O's & X's, Five W 'Bee.

Volume 5 No. 7, 1984
Benchtest: Epson PX-8/Checkouts: Memotech, Framework, HP Ink Jet Printer, Expert-Ease, Apple's Instant Artist/Teach Yourself Assembler, Part 5/Operating Systems, Part 2/Designing and selling programs, Part 1/Calling routines available in CP/M/The story behind MSX/Basic Program Conversion, Part 7: BBC/Programs: '64 Balloon, Atari Function Keys, BBC Seated, MicroBee Slalom, VZ-200 Blockout, '64 Split Screen Graphics, VIC 20 Monster Hunt.

Volume 5 No. 8, 1984
Benchtest: Sinclair QL/Checkouts: Perfect Link, Friday!, KnowledgeMan (Part 2), PlanStar, Commodore 64 Flight Simulator, Constellation, Pick/Modem protocols: XModem/Exploring WordStar/Input and Output on the Atari/\$25,000 competition: Brun's Constant/Teach Yourself Assembler, Part 6/Designing and selling programs, Part 2/Teach Yourself Lisp, Part 1/Detente between DP departments and standalone users — the Information Centre/Programs: VIC Hatchery, BBC RAM Editor, VIC 20 Life Game, Commodore 64 Connect-Four (note correction to this program in Bludners Vol 5 No. 10, 1984), VZ-200 Database, TRS-80 Color Grafx Editor, Atari Basic System Reset.

Volume 5 No. 9, 1984
Benchtest: Hewlett Packard 110/Checkouts: Framework vs Symphony, overview: Portable Computers, Jane vs Appleworks, Pick/Profile: Wayne Wilson/Teach Yourself Lisp, Part 2/Logic of assembly language, written in convertible Basic/Teach Yourself Assembler, Part 7/Braindump: Defence of the Gogotog Bird (this is a really excellent one page article — Ed)/Microchess: Cray Blitz vs David Levy/Programs: '64 Defuse, BBC Mindwaves, VIC 20 Gothic and

Greek, '64 Brackets (an updated version appears on page 76 of Vol 5 No. 11, 1984), Spectrum File, VIC Star Scramble (note: a correction to this program appears in the Bludners section of Vol 5 No. 10, 1984).

Volume 5 No. 10, 1984
Benchtest: Commodore Plus/4, Osborne Encore/Checkouts: Model 100 disk drive and video interface, Open Access, GSX from Digital Research, Netcomm modem/Is this education software any good: opinion/DIY robotics for the BBC/Combining video and PC: output on the one screen/Sorting useful-sized files without a disk/Bubble memory: has it been worth the wait/Teach Yourself Lisp, Part 3/Pirate Bulletin Boards/DIY PC-video connection/How to write great software, Part 1/Programs: Atari Autorun, Commodore 64 Basic Assembler, Apple II Menu, BBC Equation Solver, Commodore Honeypot, Atari Snake, Spectrum Voyager, VZ-200 Mini calc Spreadsheet (improved in Bludners Vol 5 No. 12, 1984), IBM PC Microcomputer Graphics, Animated '64, Spectrum Graphics and sound.

Volume 5 No. 11, 1984
Benchtest: Apricot FI/Checkouts: Olivetti M24, Sperry PC, ITT Xtra, Commodore 16, AAP's microwave news service/The

demise of the philosophy of the scholar: opinion/Artificial Intelligence: mind over matter/DIY Micro Music Circuit (to plug into a parallel port)/Computer Musicians/Teach Yourself Lisp, Part 4/Compilers: How they work and how to buy the best/Improving Commodore 64 programming skills/How to write great software, Part 2/Molecular electronics/Programs: Commodore 64 Superfile, Commodore 64 Mouse Master, '64 Sprite Editor, BBC graphics compiler/interpreter, Spectrum Crib Player, VZ-200 MON-200, Duelling VICs.

Volume 5 No. 12, 1984
Benchtest: IBM PC AT, Sony's MSX machine/Checkouts: Digital Research GEM, TI Speech Command, dBase III, Sunol network/Natural language processing/An introduction to the 68000 processor/Running your own bulletin board/Teach Yourself Lisp, Part 5/DIY Speech Synthesiser/How to write great software, Part III/Upgrade VIC 20 programs to the '64/Programs: Spectravideo Spectra-draw, '64 Hi-res Plot, TRS80 Automatic Cassette Indexer, Tandy Color/ Dragon 32 Brimstone Part One, Spectrum Life, DayFinder (written in Lisp), Commodore 64 Gremlin's Garden.

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NEWCOMERS START HERE

This is our unique quick-reference guide, reprinted every month, to help our readers pick their way through the most important pieces of (necessary) jargon found in APC. While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!

Probably the first thing you noticed on picking up this magazine for the first time was the enormous amount of unintelligible-looking jargon. In the words of *The Hitch-hiker's Guide to the Galaxy*: Don't panic! Baffling as it may sound, the jargon does actually serve a useful purpose. It's a lot easier to say VDU, for example, than 'the screen on which the computer's output is displayed.' This guide is intended to help you find your way around some of the more common 'buzzwords' you're likely to come across in the pages of APC.

For those completely new to computing,

let's start with the question: What is a microcomputer? We can think of a micro as: a general-purpose device in contrast to a typewriter, which can only be used for typing; a calculator, for performing calculations; a filing cabinet, for filing information, to name just a few of its functions. A micro can do all these things and more.

If it's to be of any use, a general-purpose device needs some way of knowing what to do. We do this by giving the computer a set of logical instructions called a *program*. The general term for computer programs is *software*. Every other part of a microcomputer

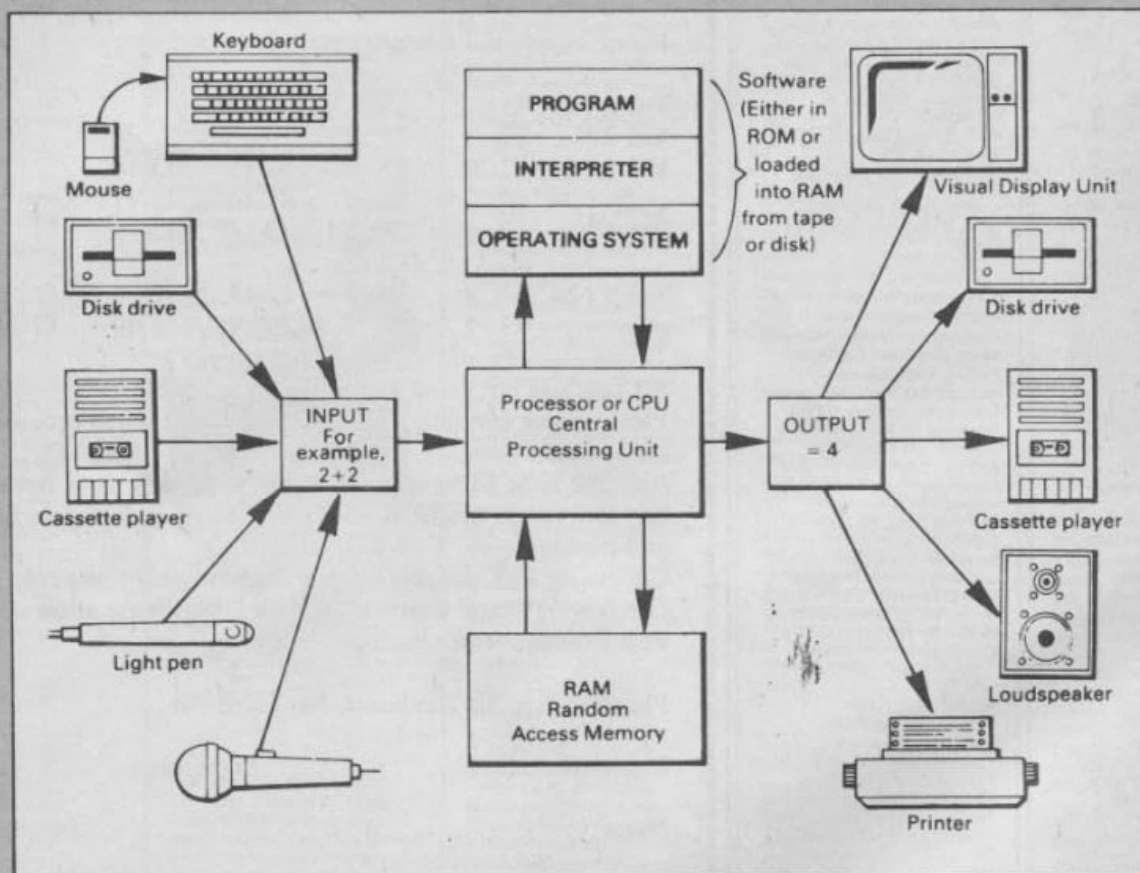
system is known as *hardware*: 'If you can touch it, it's hardware.'

Programming

Programs must be written in a form the micro can recognise and act on — this is achieved by writing the instructions in a code known as a *computer language*. There are literally hundreds of different languages around, the most popular of these being *Basic*. *Basic* is an acronym of *Beginners' All-purpose Symbolic Instruction Code*. Although originally intended as a simple introductory language, *Basic* is now a powerful and widely used language in its own right.

Other languages you're likely to come across in APC are *Forth*, *Pascal*, *Logo*, *C* and *Comal* to name but a few. These are known as *high level* languages because they approach the sophistication of a human language. You'll also see references in APC to the *low level* languages, *assembly language* and *machine code*. We'll look at these in a moment.

The heart of a micro, the workhorse, is the *processor* or *Central Processing Unit (CPU)*. The processor usually consists of a single silicon chip. As with computer languages, there are a number of different types of processor available, *Z80*, *6502*, *6800* and *8088* being just a handful (literally) of the types in common use. The processor is nothing magical — it's just a bunch of electronic circuits. It's definitely not a 'brain'.



A schematic view of a microcomputer system

As it's electronic, the processor's circuitry can be in one of two states: on or off. We represent these two states by *binary* (base two) notation, the two binary digits (known as '*bits*') being 0 and 1. It's possible to program computers in binary notation, otherwise known as machine code (or machine language) programming.

Machine code is called a low level language because it operates at a level close to that 'understood' by the processor. Languages like Basic are known as high level languages because they are symbolic, operating at a level easily understood by people but not directly understood by the processor.

Between high level languages and machine code is a low level language known as assembly language or, colloquially, *assembler*. This is a mnemonic code using symbols which the processor can quickly convert to machine code.

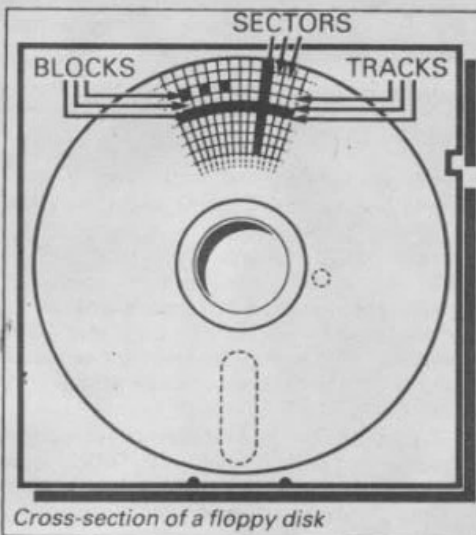
Since everything has to be converted into binary form before the processor can make sense of it, we need some sort of code to represent each character to be processed by the computer. In order to simplify communication between computers, a number of standard codes have been agreed on. The most widely used of these codes is the American Standard Code for Information Interchange, ASCII. This system assigns each character a decimal number which the processor can then convert to its binary equivalent.

A program written in a high level language must be converted into binary before the processor can carry out its instructions. We could of course do this manually, but since this is exactly the sort of tedious job computers were designed to do for us, it makes much more sense to write a program to do it.

There are two types of program to do this translation for us.

The first of these is a *compiler* which translates our whole program permanently into machine code. When we *compile* a program, the original high level language version is called the *source code* while the compiled copy is called the *object code*. Compiled programs are fast to run but hard to edit. If we want to change a compiled program, we either have to edit it in machine code (extremely difficult) or we have to go back to a copy of the source code. For this reason there is a second translation program: an *interpreter*. An interpreter waits until we actually *run* (use) the program, then translates one line at a time into machine code — leaving the program in its original high level language. This makes it slower to run than a compiled program, but easier to edit.

There are two unusual Basic words you're likely to come across: *POKE* and *PEEK*. When you program in a high level language, you are normally unable to choose in which part of the machine's memory the processor will store things. This makes programming easier as you don't need to worry about memory locations, but slows down the program since the processor has to 'look up' addresses for you. Using the *POKE* command, however, you can 'poke' a value directly into a desired memory address. '*POKE 10000,56*', for example, puts the value 56 into memory location 10000. *PEEK* allows you to examine the content of a particular memory address. If you were to follow the above poke with '*PEEK (10000)*', the computer would respond by



displaying the value 56. *POKEing* and *PEEKing* is normally done to increase program speed, but may also allow us to do things which could not be done through Basic.

Memory

So far, we have a processor and a program. Since a computer needs somewhere to store programs and data, it needs some kind of *memory*. There are two types of memory: *Read Only Memory (ROM)* and the badly named *Random Access Memory (RAM)*. ROM is so-called because the processor can 'read' (get things out of) its contents, but is unable to 'write to' (put things in) it.

ROM is used to store *firmware*, the name given to software permanently available on the machine. An interpreter is a typical example of firmware (stick with it: it gets easier!).

RAM differs from ROM in two important ways. Firstly, you can write to it as well as read from it. This means that the processor can use it to store both the program it is running and data (information). The second important difference is that RAM needs a constant power supply to retain its contents: as soon as you switch the computer off, you lose your program and data.

There is a type of RAM, known as *CMOS RAM*, which requires only a tiny amount of power to retain its contents. This is found in portable computers like the Tandy 100. It is usually powered by small ni-cad batteries so that programs and data are retained even when the main power is switched off. At present, CMOS RAM is extremely expensive and is not likely to be used in desktop machines for a little while yet. (CMOS stands for Complementary Metal Oxide Semiconductor).

Memory is described in terms of the number of characters we can store in it. Each character is represented by an 8 bit binary number. 8 bits make one *byte* and 1024 bytes make one *Kilobyte* or 1k. 32k, for example, means that the computer can store about 32000 characters in its memory. If 1024 sounds like an odd number, remember that everything is based on the binary system, thus 1,2,4,8,16... 1024 being the nearest binary multiple to 1000.

While we're on the subject of bits, you'll

often see computers and their processors described in terms of their *bit power*: 8-bit, 16-bit, 32: 16-bit and so on. This is a means of describing how large a binary number the processor can handle in one chunk. A binary number, incidentally, is known — confusingly — as a *word*. An 8-bit processor, for example, can handle 8-bit words, that is, up to 11111111 (255 in decimal). Anything larger than this has to be broken down into manageable chunks before it can be processed.

A 16-bit machine can handle bigger chunks of data at a time. This means it can handle ('address') larger amounts of memory at one time. This is why most 8-bit machines have a maximum of 64k RAM while 16-bit micros usually have 128k upwards.

As 16-bit processors can handle larger words than an 8-bit machine, they ought to be twice as fast. In practice, however, there is a little more to it than that. While it may take a 16-bit machine half as long to work out that 2+2=4, the actual processing is only part of the story.

The result of the calculation has to be placed into the appropriate memory location, passed to the screen or whatever is required. The transfers to and from the processor are often made in 8-bit form; this is why you'll hear people arguing that certain processors are not 'true' 16-bit. If the problem has to be handed to the processor in 8-bit form, turned into 16-bit, calculated and then the result turned back into 8-bit for transfer elsewhere, there may be little or no saving in time over an 8-bit system.

The other factor affecting speed is that the actual processing may form only a small part of the overall operation. A word processor, for example, spends most of its time passing files to and from disk and waiting for the user to type the next character. The processing itself consumes very little time. And if you look at the Benchmarks summary (APC, February 1984, pp 59-60), you'll see some 8-bit machines beating their 16-bit rivals — even in processor-bound operations like the APC Benchmarks.

Returning to the subject of RAM for a moment, a word of warning: Don't rush out with your new-found understanding to buy the machine offering you the most RAM for your money. Quite aside from the fact that the amount of RAM is by no means the only consideration when buying a micro (no matter how much manufacturers may stress it), different machines use differing amounts of RAM for things like graphics. Always check how much RAM is actually available to the user for program storage. Machines which proudly proclaim '64k' may well leave you with less than half of this in which to store Basic programs and data.

Back-up storage

There are numerous forms of *permanent* or *back up storage*, but by far the most common are *floppy disk*, *floppy tape* and *cassette*.

Floppy disks or diskettes are circular pieces of thin plastic coated with a magnetic recording surface similar to that of tapes. The disk, which is enclosed in a protective card cover, is placed in a *disk drive*. Disk drives comprise a high-speed motor to rotate the disk and a

NEWCOMERS START HERE

read/write head to record and 'play back' programs and data.

The disk is divided into concentric rings called *tracks* (similar to the tracks on an LP) which are in turn divided into small *blocks* by spoke-like divisions called *sectors*.

There are two methods for dividing the disk into sectors. One method is called *hard sectoring*, where holes punched in the disk mark the sectors, and the other is *soft sectoring* where the sectors are marked magnetically. The reason that disks from one machine can't be read by a different make is that each manufacturer has its own way of dividing up the disk. Recently, however, manufacturers have apparently begun to acknowledge that this situation can't go on forever, and they are working on making their disks compatible.

Since the computer needs some way of organising the disk, we have a program called a *Disk Operating System (DOS)*, usually known simply as the *Operating System (OS)*. The operating system does all the 'housekeeping' of the disks, working out where to put things, letting the user know what is on the disk, copying from one disk to another and so on. As you might expect by now, there are lots of different operating systems available, each with its own advantages and disadvantages. The three most popular OSs are *CP/M* (Control Program for Micros), *MS-DOS* (Microsoft Disk Operating System) and *PC-DOS* (Personal Computer Disk Operating System). MS-DOS and PC-DOS, incidentally, are all but identical.

Disks can support what are known as *random access files*. That is, you can randomly choose a point in a file and the drive head will move directly to that point. You can then edit the file, and only the blocks affected will be rewritten. The rest of the file remains unchanged.

Floppy disks provide a reasonably fast and efficient form of secondary storage and are cost-effective for business machines. For home computers, however, the usual form of program and data storage is on ordinary cassette tape using a standard cassette recorder. This method of storage is slow and unreliable, but is very cheap and adequate for games, for example.

Cassettes can support only *serial access files*. That is, whenever a file is to be edited, the whole file must be written back to the tape. This makes certain applications — word processing being a prime example — extremely tedious.

Floppy tape drives are a compromise between speed and cost. They use a small continuous loop tape which, like a disk, is divided into blocks. Floppy tape drives rely on serial access files, but by rotating the tape at high speed and using the block markers, they can simulate random access files.

Another type of disk you'll see referred to is the *hard disk*. This is an extremely efficient method of storing large amounts of data. Hard disk capacity generally starts at around 10Mbytes (10 million bytes) and rises to... well, you name it. Besides offering a much greater capacity than floppies, hard disks are

more reliable and considerably faster. They are, however, much more expensive than floppy drives.

Input/output

Since computers need some way of communicating with the outside world, we need *input* and *output* devices. Input and output devices include all manner of things from hard disk units to light pens, but the minimum requirement for most applications is a typewriter-style keyboard for input and a TV-like *Visual Display Unit* for output. The Visual Display Unit is variously referred to as a *VDU*, *Cathode Ray Tube (CRT)* and monitor.

The various component parts of a computer system (processor, keyboard, VDU, disk drives, and so on, may all be built into a single unit or they may be separate, connected by cables.

Take this paragraph slowly and it will make sense! When a computer communicates with an outside device, be it a printer or another computer, it does so in one of two forms — *parallel* or *serial*. *Parallel input/output (I/O)* requires a number of parallel wires. Each wire carries one bit, so with eight wires we can transmit/receive information one byte at a time (8 bits = one byte, remember). *Serial I/O*, in contrast, uses a single wire to transmit a series of bits one at a time (that's why it's called *serial*), with extra bits to mark the beginning and end of each byte.

To enable different devices to communicate with each other in this way, standards have been agreed for different *interfaces*. An interface is simply a piece of circuitry used to connect two or more devices. The most common standard serial interface is the *RS232* (or *V24*)

slow, however, and prone to interference.

The alternative method is to use a *modem*. Unlike an acoustic coupler, a modem is wired into the telephone system and you should get permission for this from Telecom.

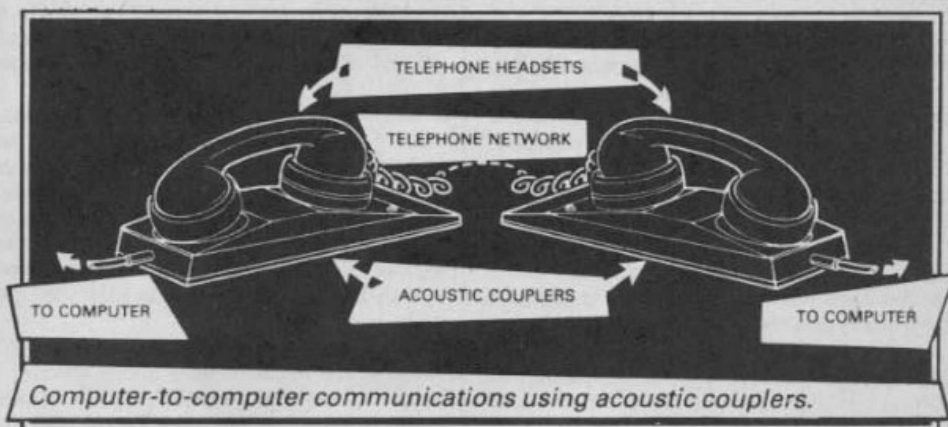
A term you'll hear used in connection with acoustic couplers and modems is *baud rate*. The baud rate is a measure of the speed at which a device can transmit and receive data. You can safely think of the baud rate as being bits-per-second, though the accurate definition is a little more complex. Therefore, a 300-baud modem can transmit/receive data at the rate of 300 bits (about 50 characters) per second.

A 1200/75 modem means that it receives at 1200 baud but transmits at 75. Most modems are 1200/75 and acoustic couplers 300/300. By way of comparison, saving programs to cassette is normally done at between 300 and 1500 baud.

Finally, communications between computers is either *full* or *half duplex*. Full duplex is when the machine receiving the data echoes it back to the machine transmitting it and says 'This is what I think you said — is that right?'. If it's wrong, the section will be transmitted again. Half duplex is where no checking is made. If you're ever unsure of which to use, start with full duplex. If everything you type appears on your display twice, then you should switch to half duplex.

Database

A database allows you to store, process and report on structured information. Most of the cheaper packages are based on a traditional card index where each card about an individual, order or item of stock is stored in a



while the Centronics standard is popular for parallel interfaces.

Networks

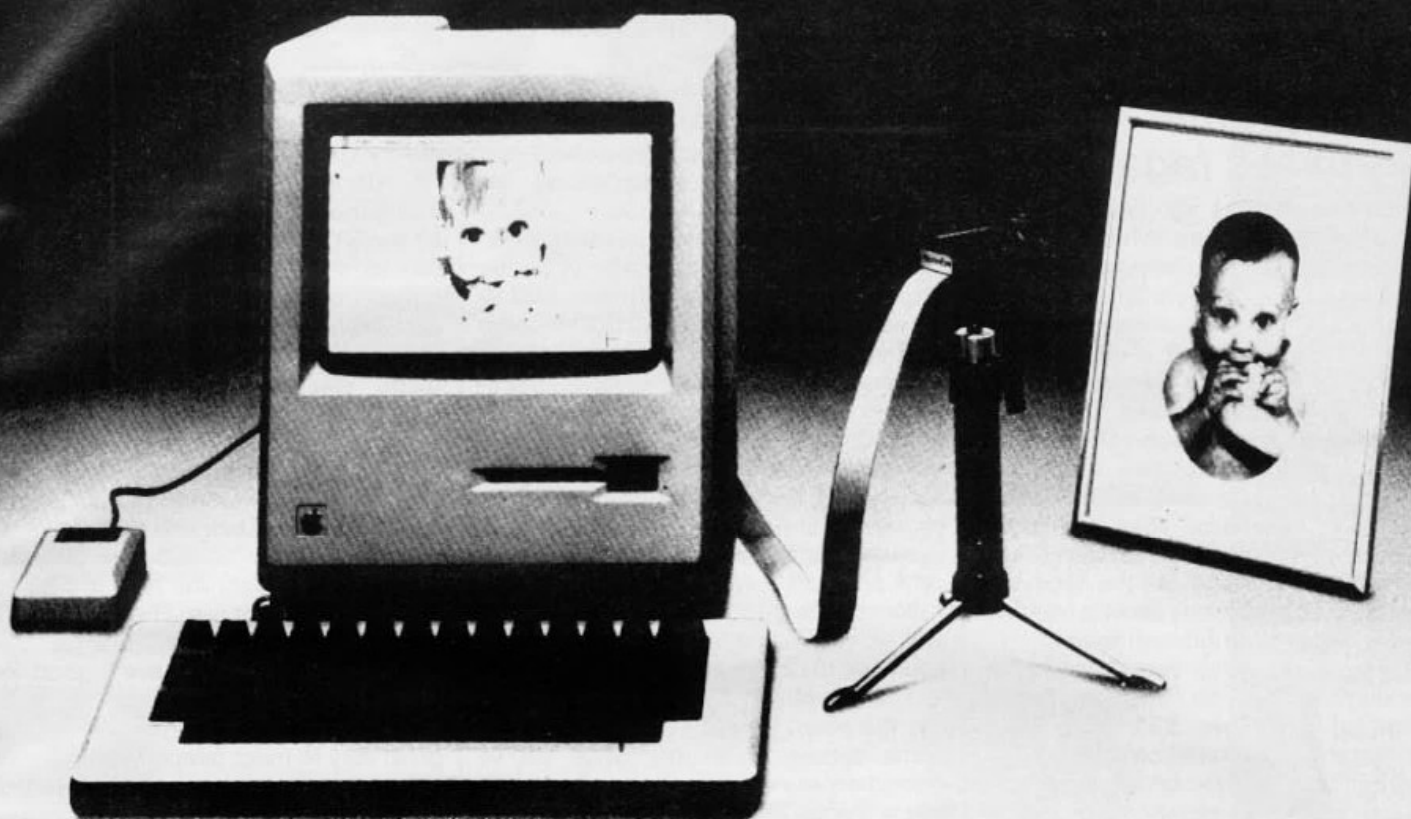
When two computers want to communicate with each other over a distance, there are again two ways of doing it (nothing is ever clear-cut in the world of micros — you'll get used to it). Both methods use the public phone network. The first is known as an *acoustic coupler*. This simply plugs into your computer, and has a receptacle into which you place your telephone handset. The acoustic coupler is convenient in that you can unplug it from one computer and plug it into another one in a matter of seconds. They are generally

single record and a group of like records is stored in a file (corresponding to the index card box). Sophisticated packages can relate several files together, so that you can process groups of dissimilar but related records.

Spreadsheet

Spreadsheet software is useful to anyone who regularly uses a calculator. The VDU acts like a 'window' on a large sheet of numbers — neatly laid out in rows and columns, occasionally interspersed with text headings. The user is able to shift the window to the point of interest and so enter text. The rest of the calculation is displayed immediately with automatic recalculations throughout.

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Peter Tootill and Steve Withers keep you up to date on the bulletin board world.

Bibliographic databases (again)

A couple of months ago we discussed bibliographic databases. While they're in a different league to bulletin boards, they are of interest to people in many professional and business areas.

We recently received a copy of the Directory of Australian Databases compiled by the Australian Database Development Association. Of the 67 publicly available databases listed, 26 are bibliographic covering areas like art, agriculture, business, road transport, and educational research. Systems still in the planning stage (at the time the directory was compiled) show a trend to full text rather than bibliographies.

The cost of using databases varies considerably but an average hourly charge of just over \$31 is quoted. Charges are often based on what you do as well as how long you take doing it, so it can pay to find an experienced user to help you with your first searches.

An interesting aspect to the directory is that it gives the reader the names of the organisations producing databases. While some are well known (like government departments and big media companies), there are some surprises like the Australian Speleological Federation and the Trichoptera Working Group!

The directory is available from ADDA, PO Box 53, Hawthorn, Victoria 3122. The price is \$35 (or \$20 if you are an ADDA member).

PC Connection IBBS

(Once again we have a 'guest contributor' — this time it's Lloyd Borrett, operator of the PC Connection IBBS in Melbourne. Lloyd also provided a list of bulletin boards that included a couple we hadn't heard of before, plus some information to flesh out the bare phone numbers published last month.)

'Right, you've been told that members of MELB-PC now have access to a Bulletin Board System, well now I'll fill you in on it. The system is my personal IBM PC (with add-ons) at home, which has been made available as a bulletin board system whenever I'm not using it (which seems to be most of the time).

The BBS program was written by Gene Plantz (US) and I've made many changes to add new features, support Australian

conditions, and fix one or two problems. Initial problems have been solved and the system is now going strong. It's already taken over 800 calls.

At present the board is open to all members of the community with the required hardware and software. MELB-PC was donated a Sendata 2000 modem by Electro-Medical Engineering, and that has become the group's contribution to the system. The phone line is provided by PC Connection Australia. There are no plans to close the system to users of systems which are not IBM and compatible. However, almost all of the resources available on the system are directed to IBM and compatible users.

Most bulletin boards, including mine, will let you in the first time you call. All you have to do is connect your computer to the telephone through the modem, dial the board number, and then answer some simple questions. Once you've gained access to the bulletin board you'll see a menu. This is a display of things you can do, and the code letters or numbers you have to enter to do them.

If you can have the terminal session saved to a disk file then do so. Alternatively, make sure it goes to the printer. You should then go hunting through the system, trying the various options, and displaying the help files. Then you can sit down later and study it. The system is designed to be easy for the newcomer to use, but this makes it a bit verbose.

Once some time has been spent learning the options, you can switch to EXPERT mode and move around the system a lot faster.

Let's consider the message system. The bulletin board has "public" and "private" messages. Public messages can be read by anyone, while "private" messages are flagged to be seen by just one other person. One word of caution. There is no such thing as a really private message. Any message you leave can be read by the system operator, usually referred to as the SYSOP (that's me). (*I know one operator who hates being called SYSOP — SW.*)

To get a Quick one line summary of the messages on the system use the "Q" command. This displays the message description. For more information, including the date entered, and who entered it, use the "S" (Summary) command. You can then use the "R" (Retrieve) command to look at specific messages.

Why not read a few? Then get back to the message section menu, and use the "B" (Bulletin) command. There are a number of "System Bulletins" prepared by the SYSOP. On my system they allow you to see lists of US and Australian bulletin boards, other user groups, and details about MELB-PC.

Once back to the message section menu you can select the "F" (File Transfer) command. Now you probably want to list the files that are available for downloading. But hold on a moment. The initial directory setting is ALL. Thus all files would be listed, and that could take a while. Use the "C" (Change Directory) command to select the type of files you would like to hunt out. Then use the "L" (List) command.

Take your time and have a good look around the system.

The bulletin board is fun to use, and a great way to meet people with the same interests. Running your own bulletin board gives you the same advantages, with the added fun of changing the program to run exactly the way you'd like a board to work. If your computer is sitting around twiddling its diodes half of the day or night, why not give it a taste of social life with a bulletin board of its very own?

Communications junkies

Just as the spread of cheap personal computers threw up a crop of 'terminal junkies' (people who spend hours on end using a computer just for the sake of it), the proliferation of bulletin boards and other dial-up systems has spawned a new phenomenon — 'communications junkies'. These people feel they have to download as much software from remote systems as they possibly can, regardless of whether they are really interested in the programs. Really bad cases go to the extreme of downloading software that's completely incompatible with their systems (like the MicroBee owner who transferred a machine code program for the Commodore 64!)

This kind of behaviour is really anti-social. Most of the systems listed in Network News are understandably popular, and it can be hard to get through to them at peak times. If you get people tying up systems for hours on end the problem is made worse. On top of that,



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- ★ Plugs straight in (hardwired phone)
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For data loading and saving, this Micron Datasette suits most home computers and features tape counter, monitor function for audio verification and slide volume control for output level.

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★ NEW ★ NEW



MB100S

The next generation of "80" type printers. 100 CPS, internal buffer expandable to 4K, Greek as well as italics. The print quality is the same as its forerunner. Square pins and film ribbon make it unbeatable.

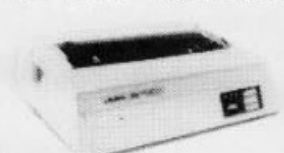
1-4 **\$325** 5+ **\$299**



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The latest addition to our range. Has a near letter quality mode. 120 CPS. Down loadable character set. Graphics, italics, emphasized etc.

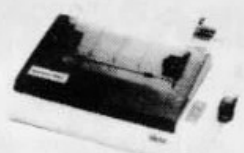
Was \$500 Now \$420



Juki printer

Professional daisy wheel printer 18 CPS full incremental mode Diablo 630 emulation. Large range of daisy wheels. 8K internal buffer available.

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Star Gemini 10

120 CPS logic seeking Italics, graphics and down-loadable characters sets. Friction and tractor. 9 x 9 matrix, Hi res. graphics. Low cost typewriter ribbon.

Was \$430 Now \$360



Star Gemini 15

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- ★ Display Characters 1000 Ch. (40 x 25)
- ★ 16 Colours (Pal)
- ★ Green Text Display

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Cat. X14520 **\$690**

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Swivel base monitor in stylish case.

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RITRON III



Great resolution, swivel base, Amber only. Prices include tax.

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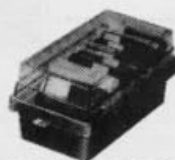
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25's or 50's

Efficient and practical! Protects your disks from being damaged or lost. Solves all those hassles of finding "that" disk.

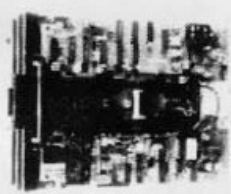
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M2896-63

Slimline 8" Disk Drive Double sided Density No AC Power required. 3ms track to track. 1.6 Mbytes unformatted, 77 track side 10⁶ bit soft error rate.

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Cat. X11022 **\$109**

M2894

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Case & Power Supply to Suit

Cat. X11011 **\$79**

M4854

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Cat. 11904 **\$350**

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Cat. X11011 **\$79**

M4853

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M4851

Slimline 5 1/4" disk drive, Double sided, double density 500K unformatted, 40 track/side. Steel band drive system.

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Cat. X11011 **\$79**

M4855

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MF353

3 1/2" Standard size disk drive, Double sided, double density, 1 Mbyte unformatted.

Cat. C11923 **\$265**

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Cat. C11921 **\$225**

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much of the attraction of BBSs comes from the variety of users. So, if the label 'communications junkie' fits you, think about your fellow users next time you log in.

Overseas News

In England a new bulletin board has started with an unusual specialty. Called "Clinical Notes Online", it runs TBBS software and is operated by ICRS-Elsevier, a publisher. If you have medical interests, it might be worth spending a few dollars on an ISD call (0011 44 254 60339, 24 hours).

A new type of BBS is appearing in the US, this is the networked bulletin board system. Once you have dialled one, you can transfer your call to another by a normal menu selection. An example is the "Mindstorm Network", which can be accessed on 0011 1 812 235 0908. We believe it is a 24 hour system.

Another new American system is called CLEO (Computer Listing of Employment Opportunities), which lists job vacancies all over the US and some other countries. There are access numbers in several cities — the Los Angeles number is 0011 1 213 618 8800.

System Listings

Once again we would like to thank all those who have taken the trouble to write to us with information about BBSs and other systems. Your help in keeping our lists up to date is greatly appreciated.

While we are grateful for all information, it would be useful if correspondents could indicate if they have personal knowledge of the system(s) concerned, or if they are simply passing on information from another source. The reason for this is that we were recently given two different numbers for the same system — one was correct, the other out of date.

We don't want to discourage anyone from writing to us, but it would make life a lot easier if you said something like "I last used this system on December 13th" or "I found this number in a list on the XYZ BBS on November 29th".

Australian systems

Micro Design Lab RCPM

Telephone: (02) 663 0150. System Operator: Stephen Jolly. Hours: 5pm-7am weekdays, 24 hours weekends.

MI Computer Club BBS

Telephone: (02) 662 1686. System Operator: Evan McHugh. Program downloading. Hours: 24 hours daily.

Sydney Public Access RCPM

Telephone: (02) 808 3536. System Operators: Barrie Hall and David Simpson. Membership required. Hours: 24 hours daily.

Prophet RBBS

Telephone: (02) 628 7030. Operator: Larry Lewis. Hours: 24 hours daily.

TISHUG BBS

Members only. Write to TISHUG, PO Box 149, Pennant Hills, NSW 2120 for information.

AUGABBS

Telephone: (02) 451 6575. System Operators: Mathew Barnes and Andrew Riley. Hours: 24 hours daily.

AUSBOARD

Telephone: (02) 955 377. System Operator: Daniel Moran. Hours: 24 hours daily.

CLUB-80 RTRS

Telephone: (02) 332 2494. System Operator: Michael Cooper for Sydtrug. Hours: 24 hours daily.

OMEN I

Telephone: (02) 498 2495. System Operator: Ted Romer. Hours: 4.30pm-9am weekdays, 24 hours weekends.

ORACLE

Telephone: (02) 960 3641. System Operator: Rowan Evans. Hours: Midnight-8am weekdays, Midnight-6am weekends.

PARIS RADIO

Telephone: (02) 344 9511. Hours: 24 hours daily.

Dick Smith Electronics RIBM

Telephone: (02) 887 2276. System Operator: Ian Lindquist. Program downloading. 24 hours daily.

Sorcerer Users Group RCPM

Telephone: (02) 387 4439. System Operator: John Woolner. Hours 6pm-8am weekdays, 24 hours weekends. Ring back system.

Ausborne Users Group RCPM

Telephone: (02) 568 2791. System Operator: Milton McGlynn-Worthington. Hours: 24 hours daily.

Newcastle Microcomputer Club RCPM

Telephone: (049) 68 5385. System Operator: Tony Nicholson. Hours: 5pm-8.30am weekdays, 24 hours weekends.

Canberra RBBS

Telephone: (062) 88 8318. Hours: 24 hours daily.

MICOM RCPM CBBS

Telephone: (03) 762 5088. System Operator: Peter Jetson. Hours: 24 hours daily.

Sorcerer Computer Users Association CBBS

Telephone: (03) 434 3529. System Operator: David Woodberry. Program downloading for SCUA members. Hours: 24 hours daily.

Melbourne PC Connection IBBS

Telephone: (03) 528 3750. System Operator: Lloyd Borrett. IBM PC program downloading. Hours: 24 hours daily.

Telebraille

Telephone: (03) 755 1341. (Austpac ?237520000). Operator: Jim Eadie. Hours: 24 hours daily.

OMEN IV

Telephone: (03) 846 4034. System Operator: Philip Westh. Hours: 24 hours daily.

HiSoft IBBS

Telephone: (03) 799 2001. System Operator: Richard Tolhurst. IBM PC program downloading. Hours: 24 hours daily.

Computers Galore IBBS

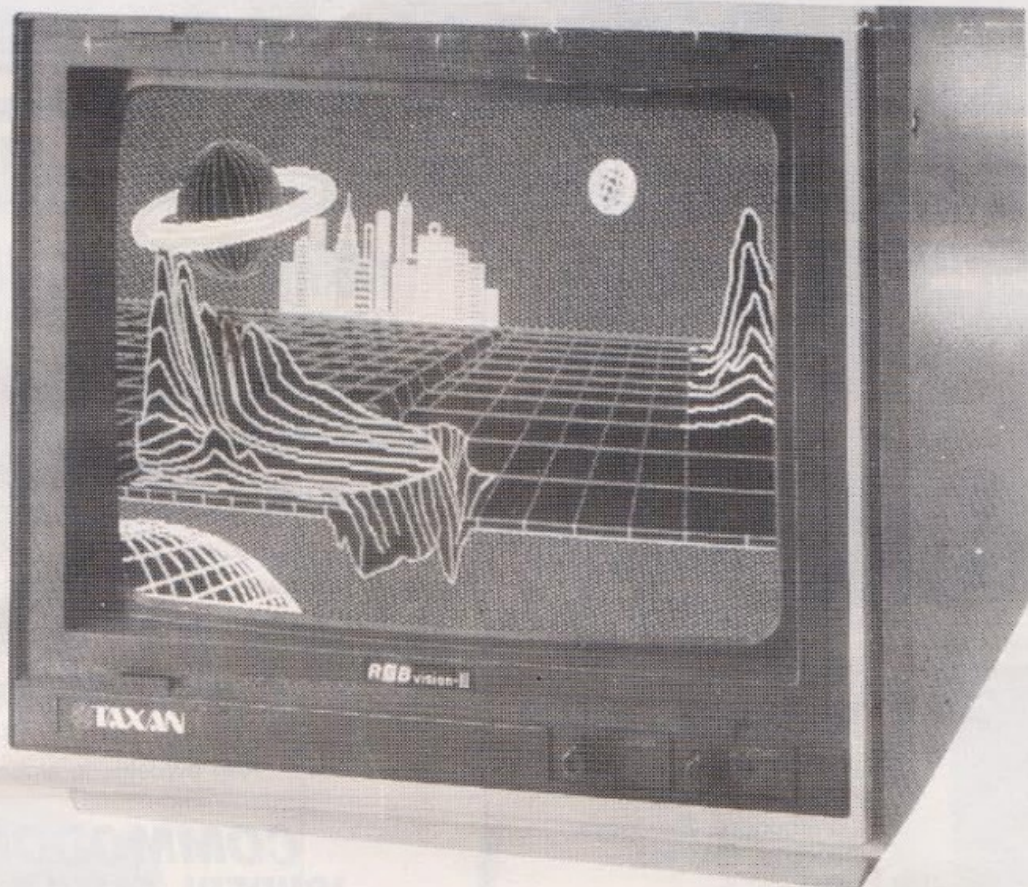
Telephone: (03) 561 8497. System Operators: Bob Cooban and Martin Scerri. IBM PC program downloading. Hours: 24 hours daily.

East Ringwood RCPM

Telephone: (03) 870 4623. System Operator: Mick Stock. Hours: 4pm-midnight Monday-Friday ONLY.

Gippsland RCPM

Telephone: (051) 34 1563. System Operator: Bob Sherlock. Hours: 24 hours daily.



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SAVE \$130**

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BMC HI-RES MONITOR

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Saves time and money and is incredibly easy to operate.

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- IBM PC 256K with 320K drive, monitor & printer interface.
- Check our range of printers, Monitors & add on boards to suit.

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Demo specials (2 only)
at \$3950 inc tax
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Recommended by Education
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\$859 exc)

Or new 'ACORN' Electron

\$389 (exc)

IMPORT BONANZA \$139 (exc)

TAXAN GREEN DISPLAY MONITOR

Model 1203



(Similar to that illustrated)

This high resolution 12 inch display is ideal for displaying sharp characters and computer graphics.

SUPER HI-RES (exc tax) \$139
(inc tax) \$159

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Includes Dataset 4 top programs Joystick and now the super expander **\$468**

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	Price (inc. tax)	*APPLE COMPATIBLE	Price (inc. tax)
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COMMODORE 2031 DISK DRIVE.....	349.00	PARALLEL PRINTER CARD & CABLE (Auto ice).....	89.00
64' REFERENCE GUIDE.....	20.00	COOLING FANS.....	49.00
DATASET.....	45.00	JOYSTICKS.....	39.00
KOALA PAD.....	129.00	PADDLES (Pair).....	39.00
EASY SCRIPT.....	79.00	RGB CARD.....	129.00
SIMONS BASIC.....	69.00	(with 80 col adaptor)	
RIFLE PRACTICE with real look rifle & s/ware.....	49.50	*MEMORY (exc. tax)	
64 FLIGHT SIMULATOR.....	69.50	COMPONENTS	
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		2764 ETROM.....	6.99
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Built for high precision, high quality and high durability. Ideal for use with TRS 80, Microbee, IBM, etc, etc.



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Double density, slim drive, single sided.

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To suit Apple 2 & 2E.

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Up to 10 times faster, heavy duty mechanism, plug directly into 64 (interface included), 6 months warranty.

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Self centering, mech & electricly, one metre cable, high tensile re-coil.

\$39 normally \$59

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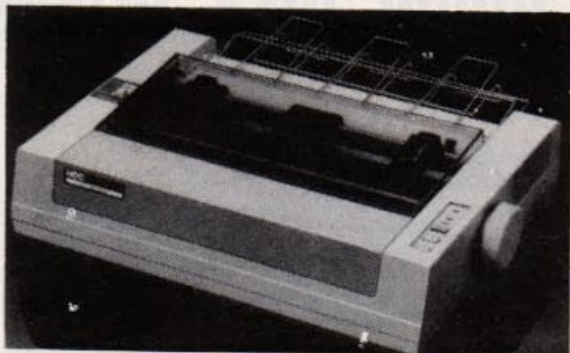
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- ALBURY 658 Dean Street Telephone: (060) 21 8088.
- BENDIGO 419 Hargreaves Street Telephone: (054) 43 4866.
- SHEPPARTON (as above) Telephone: (058) 21 7155.

- BALLARAT 307 Mair Street Telephone: (053) 31 3399.
- WAGGA 33 Thompson Street Telephone: (069) 21 6466.
- MELBOURNE: Noel Morley (03) 336 1845.

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You'll see that the best needn't cost the most



NEW MODEL

NLQ means Near Letter Quality, almost the same as a Daisywheel. Seeing is believing with this printer. Also: 120 CPS, Epson MX80 compatible, IBM matrix and graphics compatible, 1.6K buffer, proportional spacing, 10 pitch, 12 pitch, fabric or carbon ribbons.

P88/2 (Super 5)

**WITH EXTERNAL NLQ SWITCH, \$325 exc
\$389 inc**



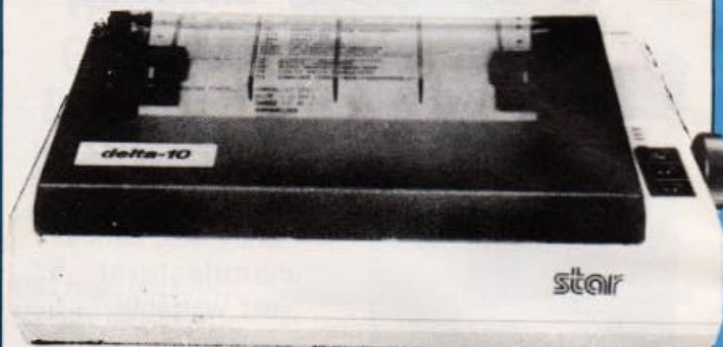
Executive

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plus Personal Pearl Data
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\$289 exc \$339 inc

Fast 120 CPS, cloth ribbon (not carbon).

Friction and tractor, roll paper feed.

Commercial quality, diecast base.

We cannot be beaten on price.

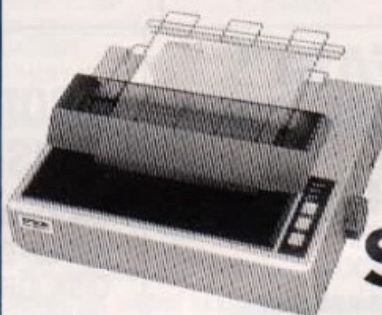
PRINTERS —

No matter what make or model we will have it.

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Easy to use, easy to own

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Freight \$4 anywhere in Australia. Prices are subject to change without notice. This ad must be quoted to qualify for special price.
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SHEPPARTON VIC 3630
Telephone: 21 7155 (058)

- WAGGA 33 Thompson Street Telephone: (069) 21 6466
- MELBOURNE: Noel Morley (03) 336 1845.

NETWORK NEWS

Mail-Bus

Telephone: (051) 27 7245. System Operator: Max Moore. Person-to-person mail. Multi-player games and bulletin board coming. Membership required for virtually all facilities. Write to M Moore, PO Box 234, Newborough, Vic 3825. Hours: 24 hours daily.

Software Tools RCPM

Telephone: (07) 378 9530. System Operator: Bill Bolton. Program downloading. Hours: 24 hours daily.

Adelaide Micro User Group BBS

Telephone: (08) 271 2043. Hours: 10am-10pm, weekends and public holidays. 9am-9pm weekdays.

Computer Ventures CBBS

Telephone: (08) 255 1946. System Operator: Daniel Schumacher. Hours: 24 hours daily.

Omen II

Telephone: (089) 27 4454. System Operator: Terry O'Brien. Hours: 24 hours daily.

Outback RCPM

Telephone: (089) 27 7111. System Operator: Phill Sampson. Hours: 24 hours daily.

OMEN III

Telephone: (09) 279 8555. System Operator: Greg Watkins. Hours: 24 hours daily.

New Zealand Systems

NZ Micro Club RBBS

Telephone: 0011 64 9 762 309. System Operator: Chris Cotton. Hours: 24 hours daily. Software up/downloading. Type "help" (in lower case) to log in.

This information is correct and current to the best of our knowledge. Please send corrections and updates to: Steve Withers, C/- Australian Personal Computer, 77 Glenhunting Road, Elwood, Victoria 3184.

Overseas systems

North America

SYSTEM	NUMBER	NOTES
SPACE Citadel	0011 1 206 839 4759	
Ckcms Citadel	0011 1 206 329 0436	
Eskimo North Minibin	0011 1 206 527 7638	
Conn-80	0011 1 212 441 3755	
CLEO	0011 1 213 618 8800	
Mindstorm Network	0011 1 812 235 0908	TRS-80 Color Computer Job vacancies Networked BBSs

EUROPE

ELFA ABC-MONITOR, Sweden	0011 468 730 0706	
ABC-Banken, Sweden	0011 463 511 0771	Half Duplex
ABC-MONITOR, Sweden	0011 468 801 523	
CBBSD Gothenburg	0011 463 129 2160	Password required 75/1200 baud
CBBS Sweden*	0011 463 169 0754	
BUG, Sweden	0011 468 463 528	BBC Micro
XD-BBS Helsinki	0011 358 072 2272	
Commodore BBS, Finland	0011 358 116 223	
Tedas, Munich	0011 49 89 596 422	
Decates, Germany	0011 49 66 154 51433	

UK

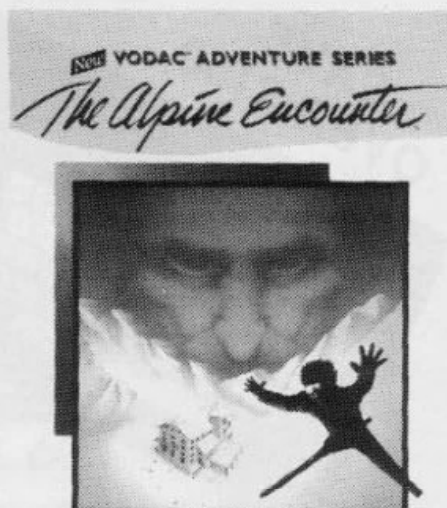
CBBS South West	0011 44 626 890 014	
Liverpool Mailbox	0011 44 51 428 8924	
BASUG	0011 44 742 667 983	
Computer Answers	0011 44 1 631 3076	
CBBS Surrey	0011 44 4862 25174	
Blandford Board	0011 44 258 54494	
Microweb TBBS	0011 44 61 456 4157	BBC Micro
Stoke Information Technology Centre RCPM	0011 44 782 265 078	
Clinical Notes Online	0011 44 254 60339	

Africa

Connection 80, Cape Town	0011 27 21 457 750	
TRShop, Cape Town	0011 27 21 5367	
Clan Computers, Durban	0011 27 31 66356	
Peters Computers, Johannesburg	0011 27 11 834 5134	
Peters Computers, Johannesburg	0011 27 11 834 5135	
War Games, Johannesburg	0011 27 11 642 3722	

* After receiving the tone and connecting your modem, either type <C>R> or <COM C>R>. The system then asks for a password which is 'cbbs' in lower-case letters. If you only get a '>' from the system, it needs resetting, so type <I> C>R.

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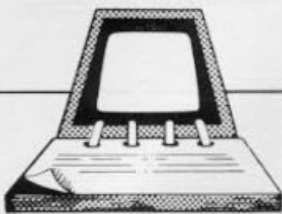
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Sydney	4th Australian Personal Computer Show Contact: Australian Exhibition Services Pty Ltd, Suite 3.2 Illoura Plaza, 424 St Kilda Road, Melbourne 3004. (03) 267 4500	March 13-16, 1985
Perth	Computers '85 Computer Exhibitions International, 190 Hay Street, East Perth 6000	May 1-4, 1985
Sydney	Data '85 Contact: Graphic Directions, 28 Foveaux Street, Surry Hills, 2010. (02) 212 4199	May 22-25, 1985
Melbourne	5th Australian Personal Computer Show Contact: Australian Exhibition Services Pty Ltd, Suite 3.2 Illoura Plaza, 424 St Kilda Road, Melbourne 3004. (03) 267 4500	July 17-20, 1985

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BENCHMARKS

A list of Benchmarks used when evaluating micros is given below.
An explanation can be found in the February '84 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K = 1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K = 0
130 K = K + 1
140 IF K < 1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K = 0
130 K = K + 1
140 A = K/K*K + K - K
150 IF K < 1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K = 0
130 K = K + 1
140 A = K/2*3 + 4 - 5
150 K < 1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K = 0
130 K = K + 1
140 A = K/2*3 + 4 - 5
150 GOSUB 190
160 IF K < 1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K = 0
```

```
130 DIM M(5)
140 K = K + 1
150 A = K/2*3 + 4 - 5
160 GOSUB 220
170 FOR L = 1 TO 5
180 NEXT L
190 IF K < 1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K = 0
130 DIM M(5)
140 K = K + 1
150 A = K/2*3 + 4 - 5
160 GOSUB 230
170 FOR L = 1 TO 5
180 M(L) = A
190 NEXT L
200 IF K < 1000 THEN 140
210 PRINT "E"
```

```
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K = 0
130 K = K + 1
140 A = K^2
150 B = LOG(K)
160 C = SIN(K)
170 IF K < 1000 THEN 130
180 PRINT "E"
190 END
```

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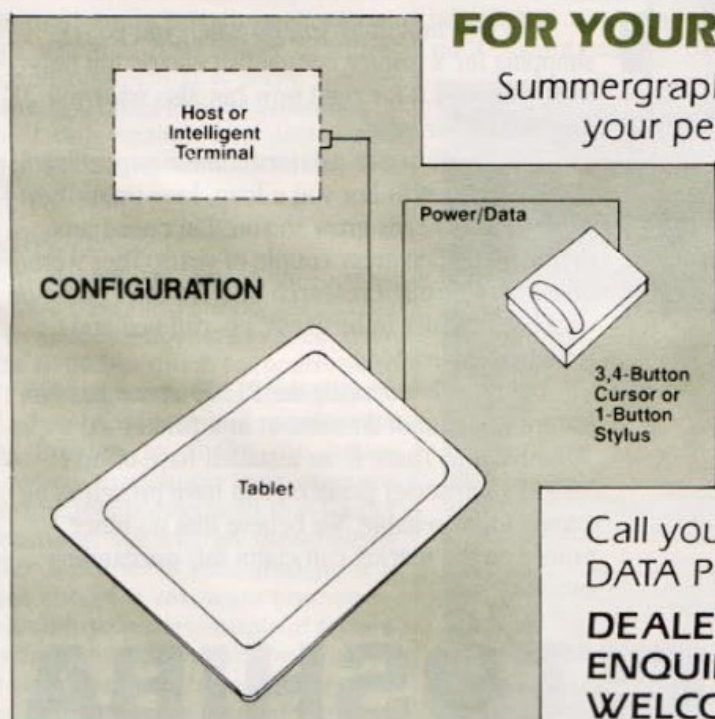
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TEOE 56 57



Juki 6100

Simon Craven looks at the Juki 6100, an inexpensive, letter-quality daisywheel printer, and is suitably impressed.

There's never been a better time to buy a computer printer but, paradoxically, choosing which one to go for has never been more difficult. The latest round of price reductions has brought daisy-wheel printers down to a level previously occupied by draft-quality, dot matrix types, so the main criterion for selecting something suitable for your particular application is the kind of compromise you are prepared to strike between speed and print quality.

The Juki 6100 certainly offers excellent print quality for a \$720 unit, but the other price you pay is a speed of only 18 characters per second. A \$720 dot-matrix printer can be expected to zip along at up to 100cps, dropping to about half that figure in a double-strike 'correspondence quality' mode.

Whether this is important to you depends mainly on the length of your printing tasks. The Juki comes into its own for letters, when the delay is never long enough to be irritating. However, with an article of 2000 words or more, the speed differential is more noticeable: the Juki takes about 12 minutes to stutter it out, against two and a half minutes for a typical mid-range dot-matrix printer.

Hardware

If your desire to see fully-formed characters marching crisply across the page overrides your impatience, then the Juki 6100 has much to recommend it. Daisywheel printers are traditionally bulky, heavy pieces of equipment which threaten to shake the house down when they burst into *staccato* action; the Juki breaks with that line of development. Its overall dimensions are 20.5 x 5.9 x 14.2ins, making it a sensible choice if you want your computer system to leave a couple of square inches free on your desk top. This is about six inches wider and two inches deeper than an Epson FX80 dot matrix printer, but a couple of inches smaller in

those same dimensions than the main daisywheel rivals.

Nor will you need to weld bracing struts to the furniture before putting your new 'toy' online. It weighs in at 27lb — about 10lb less than much of the competition — and the low weight of the moving parts keeps vibration at acceptable levels.

Noise is frequently the Achilles' heel of a daisywheel printer, but I found the Juki subjectively less irritating than an Epson FX80. Although the noise continues for a longer period than a dot matrix type, being much lower pitched the irregular beat of the daisywheel is less annoying than the predictable scream of the Epson.

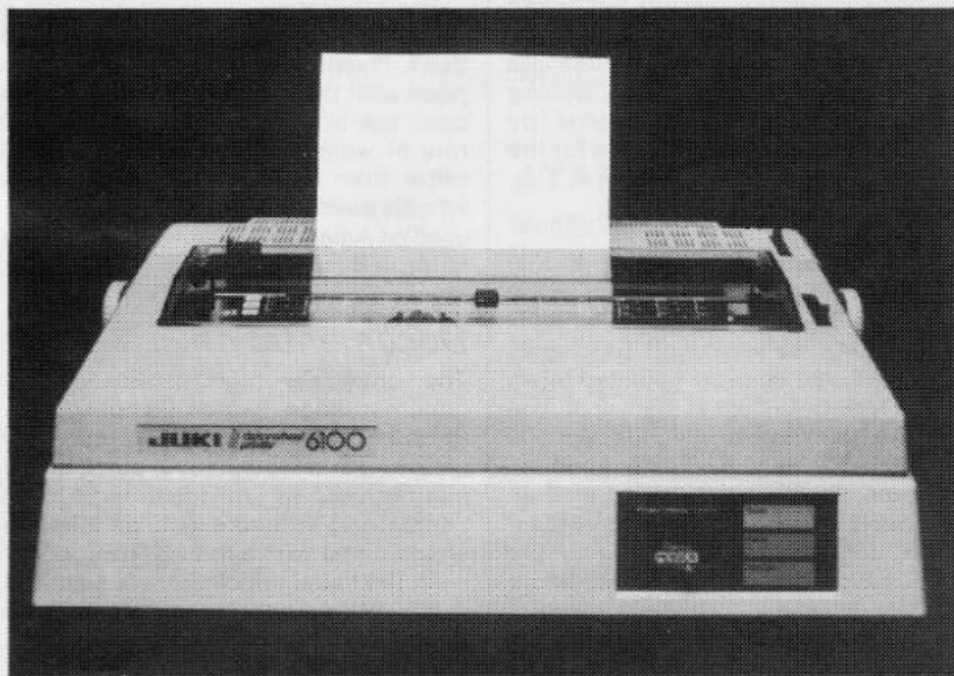
The physical design of the printer is very thoughtful. An injection-moulded plastic case keeps the internals free of dust, and the dust cover-cum-acoustic muffler is engraved with typescales for the three type pitches (10, 12 and 15) which the Juki can produce. All the controls are easy to reach, and include

two platen knobs instead of the one that many printer manufacturers provide.

The front-mounted control panel is slightly unusual. A small slider control is an immediate attention-grabber: it allows you to change the pitch setting without sending special codes through software or fiddling about with internal DIP switches. But you can't change horses in mid-stream: once it has been moved to a new position, the printer must be turned off and then on again to reset it to the new parameters.

WordStar users, indeed, anyone whose word processor allows the use of an alternative character set, can still use software control to alternate between, say, 10-pitch and 12-pitch.

There are three touch-sensitive keys to the right of the slider, but instead of the normal Line Feed, Form Feed and On Line/Off Line toggle, you get separate keys for Off Line (here marked Pause) and On Line (marked Reset). The Form Feed function remains, but Line Feed is not present.



One of the most inconvenient aspects of many printers is gaining access to the DIP switches, but the Juki is definitely superior in this respect. All you have to do is pull off the top part of the case and a single bank of switches is revealed — no screws to undo, no need to remove the ribbon nor the paper. It is, however, a good idea to switch off the power before you get stuck in!

The functions of the switches themselves are straightforward enough. Switch 1 determines whether or not a carriage return should automatically imply a line feed, and switches 4 to 6 are used in various combinations to select one of the eight international character sets available. Switch 7 distinguishes between continuous stationery and single sheets, 8 gives two choices of form length, and 9 provides two options for the spacing between lines.

So far, so conventional, but switches 2 and 3 offer a little more of interest. Switch 2 selects one of two levels of daisywheel impact. In my case, the lower intensity setting proved more than adequate for normal use, and probably reduced wear and tear on the plastic daisywheel supplied, but if you want to produce a clear impression through weighty wads of carbon paper then you can turn the power up.

Switch 3 is aimed at users of the IBM PC. The PC has a couple of idiosyncratic tricks up its sleeve, including a habit of cutting off diplomatic relations with any peripheral it hasn't heard from for a while. If a signal is not received from the peripheral, be it a modem, printer or plotter, then the communications channel is closed after a certain period of time. This can cause problems with parallel printers, as the PC gets impatient when it fills the Juki's 2k buffer and can't send any more data.

A couple of software patches are recommended in the manual. Setting switch 3 to ON sets the scene by selecting the appropriate mode for the buffer's data processing.

Setting up

Hooking up your computer to a Juki 6100 is unlikely to cause too many problems. The standard parallel interface, using an ordinary Amphenol connector, can be supplemented by an RS232 serial interface at extra cost. The codes which turn on and off various features such as underlining, shadow, bold and double printing, as well as superscripts and subscripts, have been made identical to those used by the Diablo 630. Any piece of software which includes a printer installation menu is likely to include a driver suitable for the Juki.

This compatibility with convenient standards also extends to the ribbon, which is like that of an IBM Selectric typewriter. Supply of single-pass carbon ribbons and the more durable multi-strike cloth ribbons is unlikely to cause any headaches. Using single-pass carbon ribbons makes the print quality especially crisp and clear, but the traditional drawback is the need to buy a replacement ribbon at short intervals. The 6100 does a very good job at squeezing the most out of its ribbons, striking each bit of the ribbon in three vertically arranged tracks. The ribbon life is 160,000 characters, or about 27,000 words, although the multi-strike cloth alternatives should be good for at least 100,000 words before the print becomes faint.

The advantage of a cloth ribbon is not the decrease in running costs, of course — it's the progressive way the ribbon wears out. If you stick to carbon ribbons the time will come when, say, it's eleven o'clock on Sunday evening and your

you are looking for. There's also a decent index — a feature noticeable by its absence on too many computer products. It's all beautifully written with a noticeable American idiom which manages not to get in the way of the information, and never skimps on the well-presented technical information. The design is clear and entertaining, with numerous cartoons injecting a little levity into what could too easily become a dull subject.

What makes the documentation stand out in terms of content as well as presentation is a series of chapters devoted to interfacing the Juki to the most popular personal computers, and the most likely choices of word processing software for those systems.

The computers covered are the IBM PC, Apple II family, Kaypro II, Osborne 1 and TRS-80 Model III. The software featured is mainly the relevant versions of WordStar, although Perfect Writer also puts in an appearance and the Tandy chapter goes into Superscript.

'Hooking up your computer to a Juki 6100 is unlikely to cause too many problems. The standard parallel interface, using an ordinary Amphenol connector, can be supplemented by an RS232 serial interface at extra cost.'

last ribbon runs out in the middle of printing a 12-page report which has to be on somebody else's desk by nine o'clock the next morning. If you have a cloth ribbon, you can always squeeze a few more pages of print out of it, even if the quality isn't everything you might have hoped for.

The other major consumable with a daisywheel printer is the daisywheel itself. Plastic wheels like the one supplied with the printer have a low initial cost, but in the long-run their higher rate of wear makes them less economical than metal wheels. The daisywheels used are compatible with those used on Adler machines, so there should be no difficulty in getting hold of your required typeface.

Documentation

The unusually high quality of the documentation which accompanies the Juki 6100 is a powerful incentive for selecting this product over some of the alternatives. In an ideal world, all computers, software and peripherals would come with a manual this good.

All the usual information is supplied in a clear and concise format, and the well-designed contents pages make it easy to get straight to whatever snippet

The explanations of how to get the most from your system even suggest using DEBUG.COM to patch your WordStar program files.

Optional extras

Optional extras for the 6100 include a continuous stationery tractor-feed device with an accompanying end-of-paper detector. Another possible enhancement is the expansion of the 2k static RAM print buffer to 8k, just by plugging in 2k RAM chips until the desired capacity is reached. A list of compatible memory chips is given in the manual, along with full fitting instructions.

Conclusion

Overall I was very pleased with the Juki 6100. With the prices of this class of product falling steadily it's difficult to make specific recommendations about the value for money offered by various competitors, but operationally the Juki is extremely competent with no noticeable weak spots.

If you are in the market for a low-cost letter-quality printer, I can foresee few grounds for dissatisfaction with the 6100.

END

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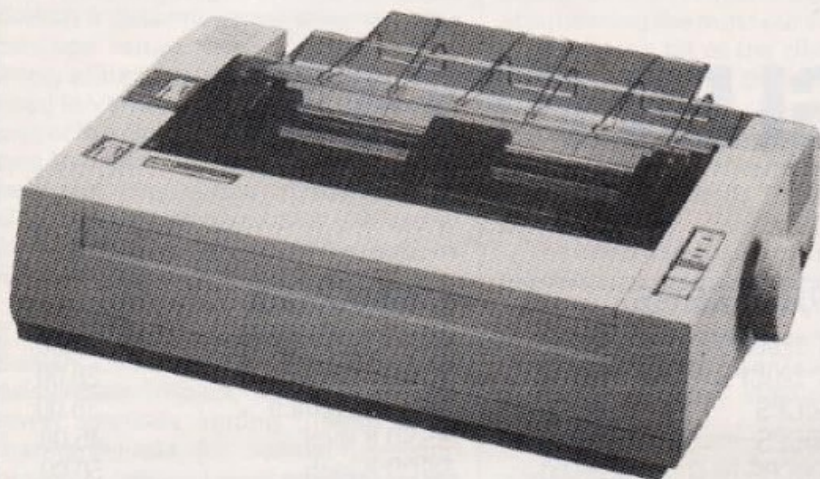
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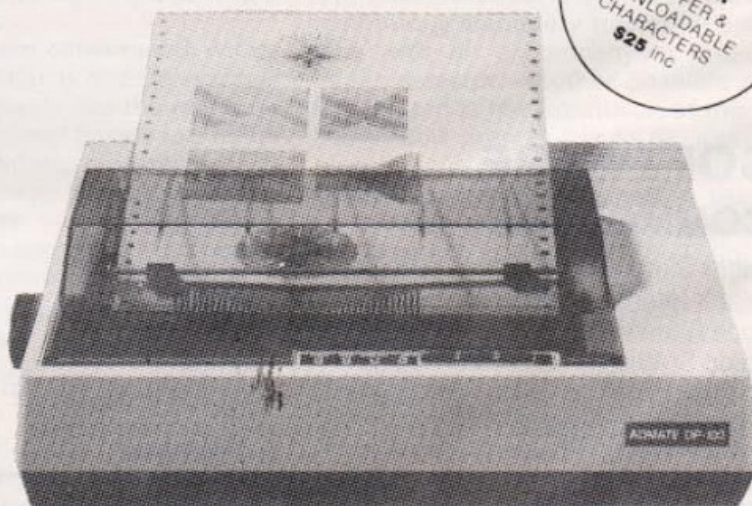
Print Rate	120 cps (59 LPM)
Line Feed Speed	100 msec
Print Direction	Bi-directional with logic seeking
Input Buffer	1 KB
Character set	Standard Mode: 96 ASCII characters with descenders 11 semi graphics, 8 international characters Italic characters IBM-PC Matrix Printer Mode: 96 ASCII characters with descenders 64 block characters, 9 international characters IBM-PC Graphic Printer Mode: Additional ASCII contain European, Graphic, selected characters, math and extra symbols
Font Registration	Up to 40 characters
Character Structure	9 x 9
Character Size	Ordinary characters 1.99(W) x 2.24(H) mm Superscript/ subscript characters 1.9(W) x 1.36(H) mm
Characters per line	Ordinary (pica/elite) 80/96 Double width elongated (pica/elite) 40/48 Compressed (pica/elite) 132/158 Compressed and elongated (pica/elite) 66/79 Superscript, subscript (pica/elite) 80/96
Paper Feed	Friction feed, Sprocket feed
Paper Width	Fanfold 4-10 inches Cut sheet 4-9 inches
Copies	3 max.
Interface	Standard Centronics-style 8 bit parallel Optional RS232C with 2K buffer (X/ON-X/OFF and ETX/ACK protocol)
Ink Ribbon	Cassette (Service life: 3 mil characters)
Head Service Life	Over 100 mil characters

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Character sets	ASCII characters — 192 (96 normals and 96 italics). JIS characters — 160 (64 katakana and 96 alpha-numerics). Semi-graphic units — 103. International Specials — 2 for U.S.A., 1 for UK, 8 for German, 8 for French, 4 for Swedish, 2 for Italian, 6 for Spanish, 48 for Greek, 6 for Danish and 2 for Japan.
Printing Speed	100 C.P.S. for normal size print. 200ms for line feed.
Columns/line	Normal — 80 columns. Condensed — 142 columns. Enlarged — 40 columns. Condensed/double width — 71 columns. 'ELITE' — 96 columns. Enlarged 'ELITE' — 48 columns.
Printing direction	Text and semi-graphic — Bidirectional, logic seeking, (programmable) Super/subscript and bit image graphic — Unidirectional left to right.
Line spacing	6 L.P.I. — 4.23mm. 8 L.P.I. — 3.18mm. Programmable in increments of 0.35mm (1/72) and 0.118mm (1/216").
Paper feed	Adjustable sprocket feed and friction feed.
Paper type	Fanfold, Single sheet, Roll paper. Thickness — 0.05mm (0.002") to 0.25mm (0.01") Paper width — 101.6mm (4") to 254 (10")
Number of copies	Original plus 2 copies by normal thickness paper.

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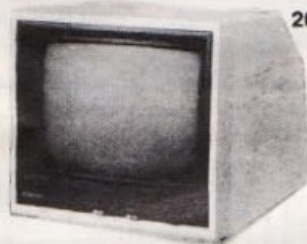
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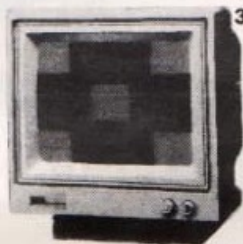
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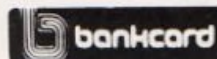
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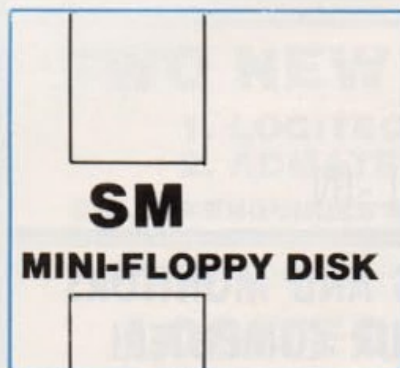


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PRINTING MECHANISM

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Print Direction: Bidirectional in text mode
Unidirectional in bit graphics
Number of Pins in Head: 9
Line Spacing: 1/6", 1/8", n/72", n/216"
Programmable

PRINTING CHARACTERISTICS

Character Set: 96 ASCII Characters, with descenders, plus 9 International Character Sets
and 96 Italic Characters 128 Downloadable Characters
Printing Modes: 9 x 9 matrix standard
(10 CPI) 11 x 18 double strike (advance paper 1.216" and repeat line)
18 x 9 emphasized (shift right dots)
18 x 18 double strike emphasized

INTERFACE

Standard: Centronics-style 8 bit parallel
Multi-Font Interface
Word Processing Card
Optional: RS-232C Intelligent Serial w/2K Buffer or 32K Buffer and XON/XOFF protocol
Centronics Parallel w/2K Buffer or 32K Buffer
Intelligent IEEE-488 Interface
Simple IEEE-488 Interface

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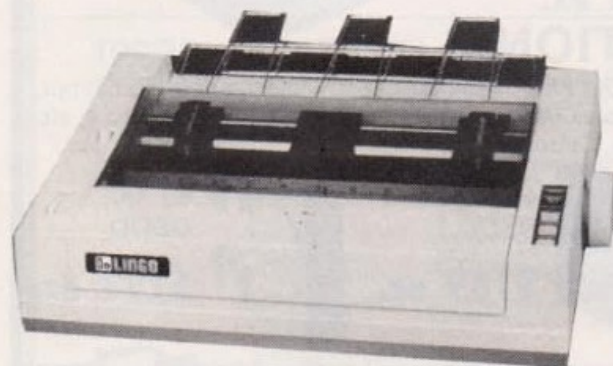
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Prize Puzzle

A certain 7-digit number contains no zeros and is not palindromic (that is, it does not read the same from right to left), but it does have the property that if its digits are reversed, the resulting 7-digit

number is a factor of the original number. What is the original number?

Answers, on postcards or backs of envelopes only, to: APC Prize Puzzle, January 1985, Lazing Around, 77 Glenhantly Road, Elwood, Victoria 3184. Entries to arrive not later than January 31, 1985

September Prize Puzzle

The answers are as follows:

(a) The largest perfect square with digits in ascending order is 134 689.

(b) The largest perfect square with digits in descending order is 961.

Winner: Sue Marshman of Yokine, WA. Congratulations!

BLUDNERS

In line 60 of the machine code programs for horizontal scrolling of the screen of the VIC 20 in TJ's column of the September '84 issue, 157,0 was printed twice instead of once in the data statement of the left to right program.

Page 21 of the November issue contained a reference to Vault Corporation's Prolok (anti-piracy protection) software. The phone number given was said to be for Vault Corporation in California. In fact the number was for Vault's Australian Distributors, Communication Control in

Sydney.

APC SAMPLE SOFTWARE: If you've ordered the following disks: Electric desk, Attache Accounting, Aura, DR Draw, dBase III, DR Graph and SuperCalc III — you may be wondering why they aren't working. They've been copied incorrectly. We extend our sincere apologies and ask you to send back the disks to 54 Park Street, Sydney 2000. We'll supply you immediately with a good working copy.

Go to it

LOADGO "GOTO THOU

SLUGGARD":

REM APC SEPTEMBER 84

RETURN without GOTO at line 15

Ready

EDIT 10

10 It seems . . . my point.

END

David Bradnack

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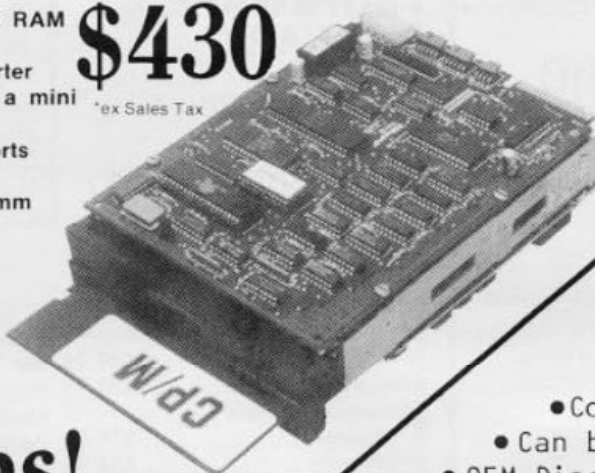
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1967

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